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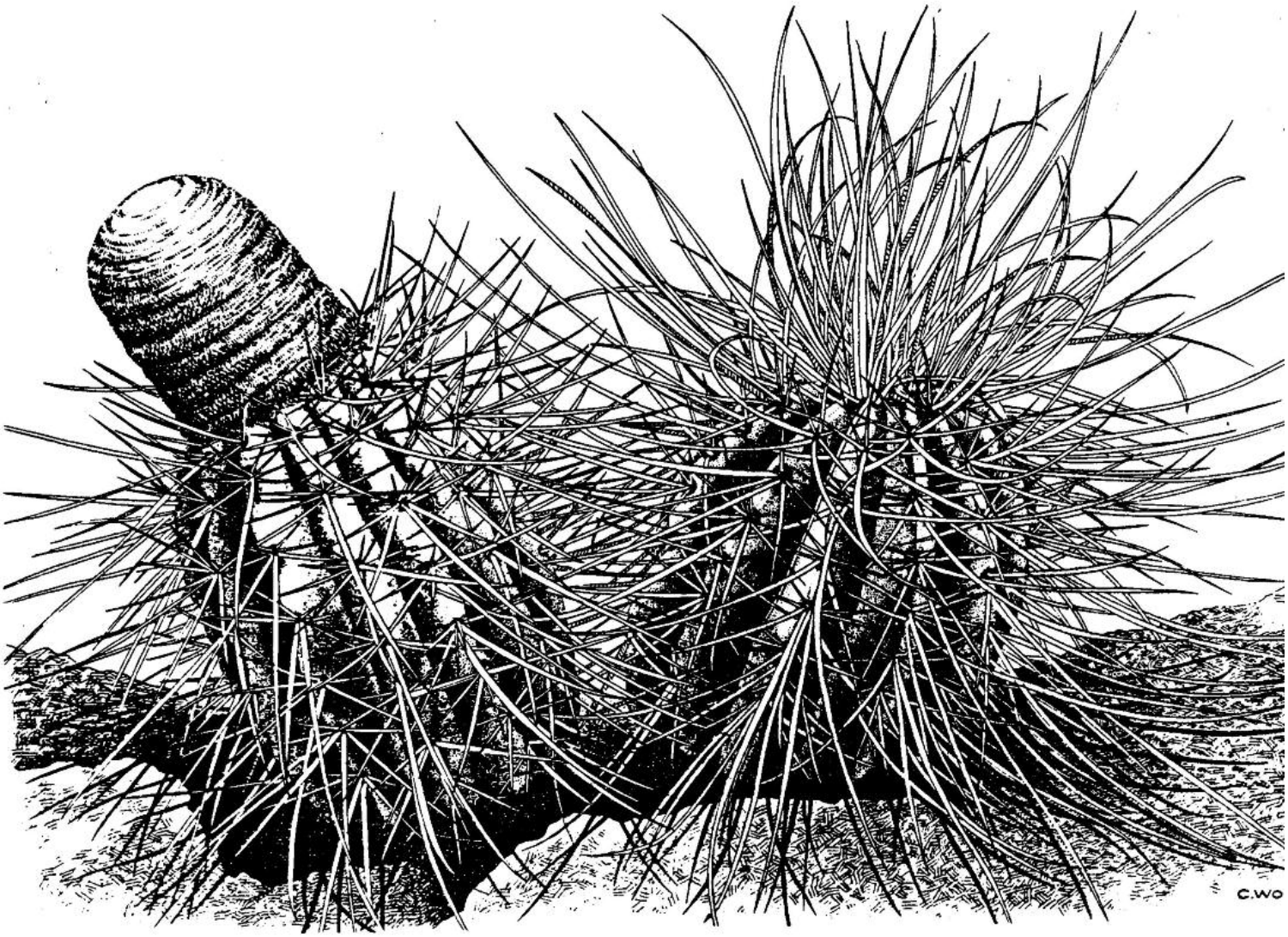
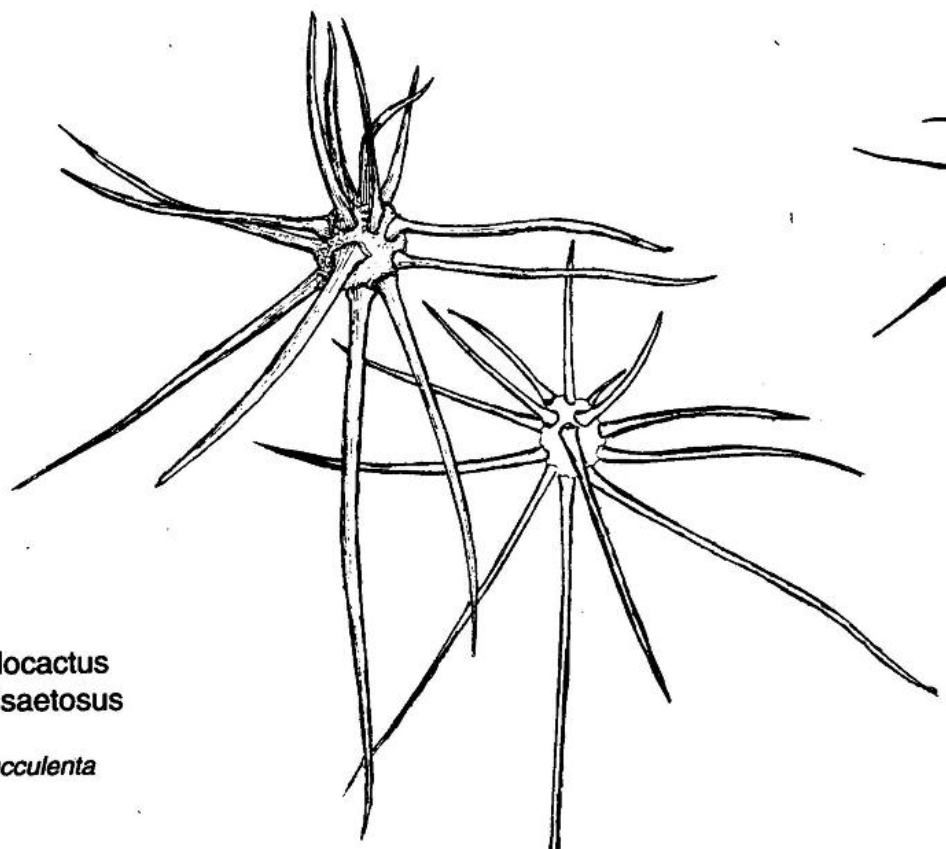
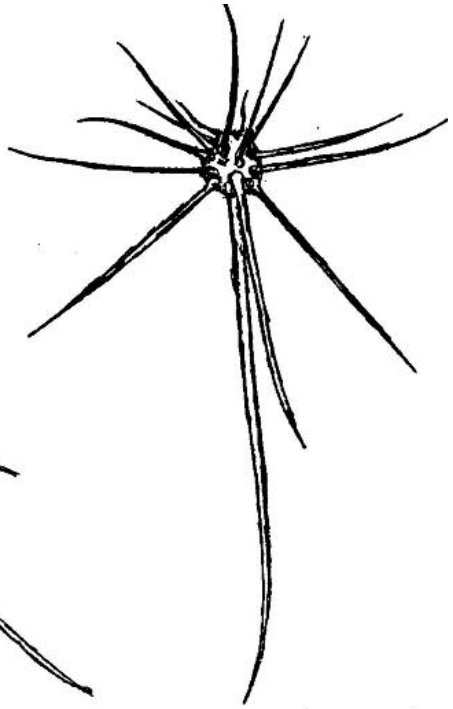


Melocactus longispinus

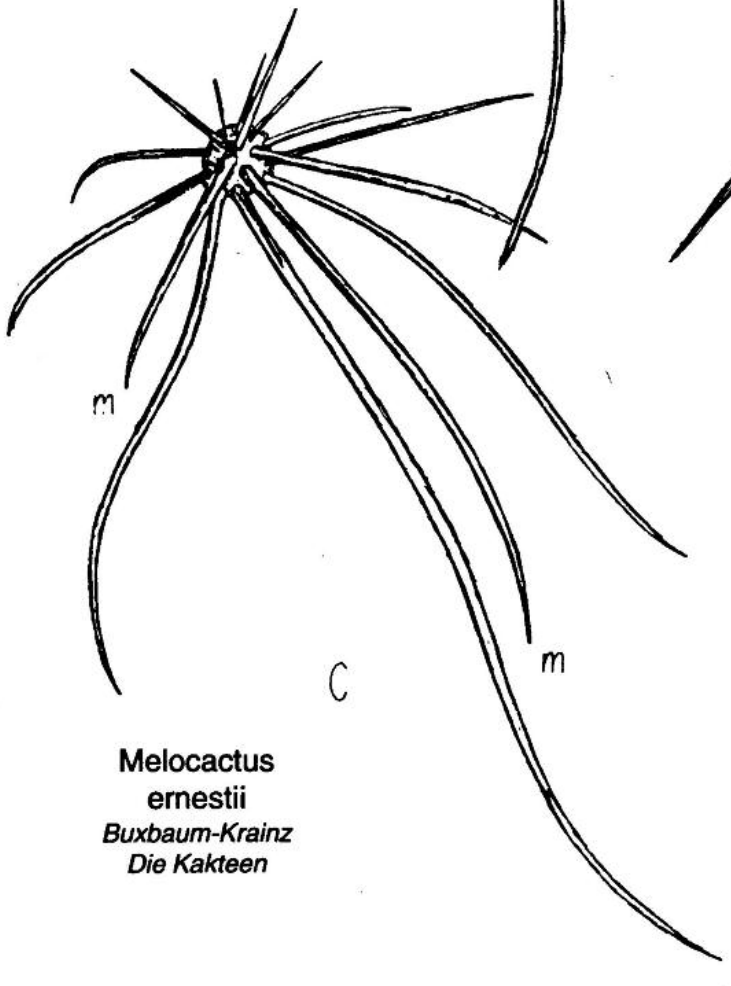


Melocactus
rubrisaetosus

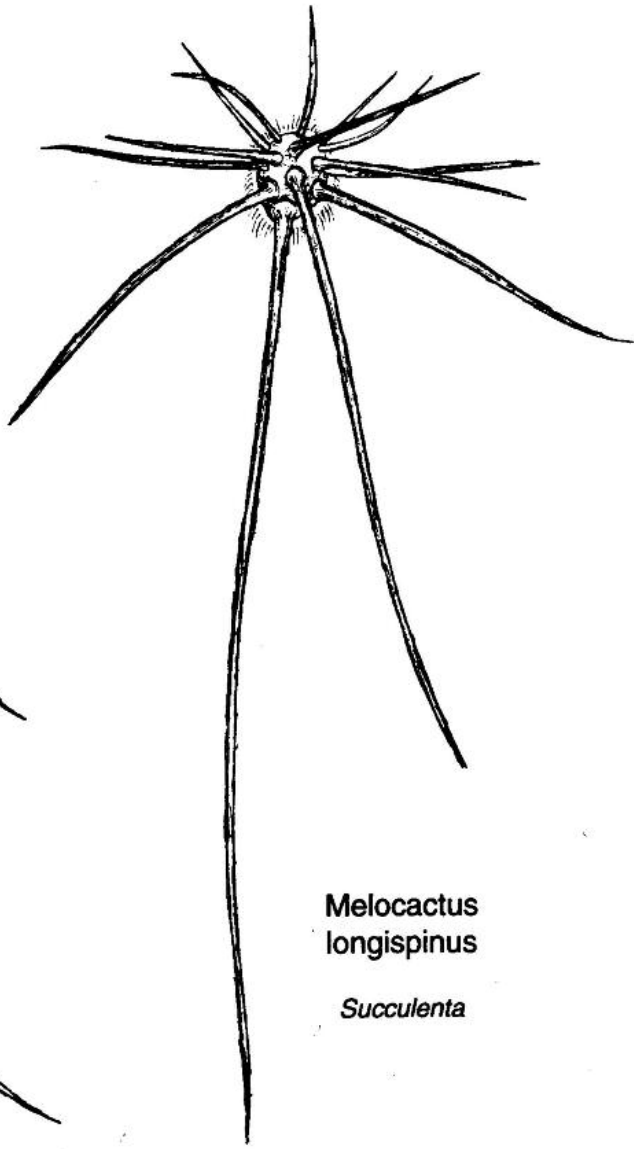
Succulenta



Melocactus
oreus
Buxbaum-Krainz
Die Kakteen



Melocactus
ernestii
Buxbaum-Krainz
Die Kakteen



Melocactus
longispinus

Succulenta

2

MELOCACTUS LONGISPINUS ....? From D.Angus

When I was paying a visit to Fearn's nursery in 1980 my eye was caught by a Melocactus because of its rather interesting looking long spines. However on closer inspection it proved to be in a rather sad way, looking as though it could do with a good plumping up with water. It was actually concave on the underside, with a few poor roots tucked away inside the recess forming the base of the plant. Nevertheless it seemed to be alive so I decided to buy it and try to get it to grow.

It was treated very cautiously, being watered somewhat sparingly but as frequently as I watered all the rest of my plants. Although it showed no signs of responding, I persevered with this treatment not just for a season, but for three or four years. Eventually I came to the conclusion that if it was to be persuaded to move, something more drastic was required. So I started to give it water, not just liberally, but enough to almost drown it. To my pleasant surprise, it started to plump up and has never looked back since, making a nice looking plant with a body about five inches across. In the autumn of 1987 it started to produce a few wisps of short bristly hair right in the growing point, which I took to be the start of a cephalium. Before the winter was out it had produced a small cephalium, roughly half an inch across. This nearly doubled in size during the latter part of 1988 and at the same time it also started to produce flowers. These are a really bright pink colour, almost a day-glow pink that really catches the eye. During January and February the fruits appeared, in ones and twos at a time; these are a very pale pink colour and quite cylindrical in shape, not the conical shape which is quite common in Melocactus fruit.

All my Melocacti are growing together, each in its own pot, stood on gravel over a two inch deep tray of sand in which is a buried soil heating cable. This operates off an automatic soil/air thermostat which is set at 80°F. Not only are the pots watered, but the tray on which they are standing is filled to the brim with water. Watering starts with all my other plants. early in the year when temperature and weather suggest it may be suitable, and continues through to September, after which they are left completely dry for the winter. When the watering ceases, the soil heating tray is switched on and this will run until the following Spring. All the Melocacti growing in this way have pushed their roots out of the bottom of their pots into the tray below, so they will pose a real problem when I have to repot or move them. Recently I have adopted a practice of switching the soil heating thermostat down to 20°F overnight, in order to simulate more of a warm day/cool night cycle which I imagine that the plants are likely to live under in their habitat.

This plant was labelled Melocactus itaberabarensis but I have never been able to find any reference to a Melocactus under this name. What should it be called?

.....from H.Middleditch

The most eyecatching feature of the Melocactus grown by D.Angus is the very long spination. This gives the plant a quite different appearance to any Melocactus that I had seen previously. Perhaps we usually expect the most prominent spine on a cactus plant to be the central spine, or one of the central spines, but on this plant the longest spine does not appear to be a central spine at all, but is the lowermost radial spine. On that account it does not stand more or less straight out from the body, but tends to grew somewhat obliquely downwards, or more parallel to the ground on the upper part of the body. In order to try and find a possible identity for this plant it was necessary to search the literature for any reference to Melocacti with spines of this sort of length. It was quite a surprise to discover that there were several species which had this particular characteristic. There was an early nineteenth century description which might even be a suitable name, which made it still more surprising that I had not seen a Melocactus with this length of spination until now. So it then became a case of comparing the descriptions and other references, especially place names and locations, to see which might be the most appropriate name in this instance.

.....from J.Arnold

Although many cacti may have central spines or spine which are longer than the radials, in Melocactus it is most common to find that it is the lowermost radial spine which is the longest spine on an areole. This can be seen not just in the longer spined plants but also on many of the shorter spined Melocacti.

MELOCACTUS OREAS By F.A.G.Miquel. From Acta. Acad. Caes. Leop. Carol. Nat. Cur. Vol.18 1839; reprinted in Miquel, Monographia Generis Melocacti 1840

Two species, probably new, were briefly sketched out to me by Cl. Lemaire in his letter of 8 May 1839.

Melocactus oreas. Melocactus, elongated-globular, ribs 16, areoles compact bare or woolly, central spines 8 of varying size, thread-like bent alternatively in opposite directions, radial spines few, feeble. Cephalium flat, with long white wool. Example seven inches high. Areoles half an inch apart. Habitat near Bahia, probably on mountain slopes.

Observation. This species only very briefly mentioned, observations kindly awaited from Lemaire for it to be carefully described in a supplement, to be published hereafter if it survives.

.....from H.Middleditch

The port of Bahia (or Salvador) was the site of the very first Portugese colony in South America, established in 1532. Later in that century the growing of sugar cane was established around Bahia where it rapidly prospered due to increasing demand from Europe and elsewhere. The area devoted to the growing of sugar cane gradually extended inland from the port by the establishment of estates on suitable ground with adequate access to the port. By the early 19th century, travel in the hinterland of the port of Bahia would offer no great hazards or difficulties. The original Melocactus oreas would probably be found within the area over which the sugar cane estates were spread at that time, i.e. at a relatively short distance inland from the port.

.....from R.Mottram

In this extract it is stated by Miquel that M.oreas was communicated to him by letter from Lemaire. Therefore the correct citation ought to be Melocactus oreas Lemaire in Miquel, Monographia Melocacti. Also I note that the page number in my own copy of the Monographia Melocacti (pp 112-113) differs from the citations of later authors.

.....from H.Middleditch

In Werdermann's Bluhende Kakteen and in Krainz' Die Kakteen, the date of Miquel's publication is given as 1838. Yet Miquel describes M.oreas on the basis of a letter from Lemaire dated May 1839. My own copy of the first description was supplied by Cambridge University Library and it is on p.192 of Mono. Melocacti. I do not understand the discrepancy between either the two dates, or the page numbering.

.....from R.Mottram

Now that I have been able to refer to a bibliography of taxonomic literature, I find that Miquel's Monographia Generis Melocacti first appeared in Acta. Acad. Caes. Leop. Carol. Nat. Cur. Vol 18, published December 1838, consisting of pages 80-182. An Additamentum Primum was published in March 1939, presumably in the same journal, consisting of pages 183-186. An Additamentum Alterum was published in November 1839, again presumably in the same journal, consisting of pages 187-193, with M.oreas on p.192. This summarises parts of the new classification proposed by Miquel in Genera Cactearum, published in Bulletin des Sciences Physiques & Naturelles en Neerlande (1839, presumably before November), together with information contained in Lemaire: Cactearum Genera nova speciesque novae et omnium in horto Monvilliano cultarum (1839), about new Melocacti. In September 1840, the whole monograph was reprinted as a book, with pages renumbered 1-113, to which was added "Explicatio Tabulum" (p. 114-118) and index (p.119-200). The p.192 cited by Werdermann is probably from the journal, but the date should have been quoted as 1839.

.....from H.Middleditch

There does not appear to be anything in this first description which would suggest to me that Melocactus oreas displays a very long lowermost radial spine. Indeed the radial spines are specifically stated to be "few and feeble". In N.P.Taylor "Notes on the Genus Melocactus (1)" in C&SJ G.B. 42(3) 1980 and in Bradleya 9/1991 there are illustrations entitled M.oreas. These depict plants with robust radial spines of which the lowermost appears to be the longest, together with one (or two) central spines. From Lemaire's description it is difficult to understand how the name oreas can be associated with a Melocactus displaying such robust and lengthy radial spines. A possible explanation is that Lemaire regarded the prominent spines as centrals - but it would be most difficult to ascribe more than three centrals to either of the foregoing illustrations, certainly not eight.

.....from A.F.H.Buining, C&SJ U.S. XLVI 1974.

Britton & Rose placed M.ernestii as a synonym to M.oreas ... it is certain that Dr.Rose only saw and collected M.ernestii and not M.oreas, for they are quite different, which we shall see in dealing with M.ernestii.

.....from H.Middleditch.

This article by Buining includes a photograph of M.ernestii with very long lowermost radial spines. But in that part of the article dealing with M.ernestii I cannot find any explanation of the difference between M.oreas and M.ernestii.

MELOCACTUS OREAS By E.Werdermann,
Translated by H.Middleditch from Bluhende Kakteen, Plate 58;1933

Habitat Brazil, in the State of Bahia, at Bananeiras, in the vicinity of the capital city Sao Salvador (Bahia). The plants illustrated on Plate 58 were photographed in April 1932 at their natural location.

Most significant features:- Body more or less globular, sometimes rather tapered above, flowering plants up to about 10-12 cm tall and broad, crown in young specimens with fluffy white wool, overtopped and enclosed by projecting spines. Body colour matt pale- to dark-green. Ribs 12-14, on large plants even a few more, regular, 0.5 to 1.5 cm high according to the age of the plant, rounded at the crown of the rib, with chin-like tubercles projecting closely above the areoles. Areoles about 1 to 1.5 cm apart, almost circular, occasionally somewhat elongated. about 3-4 mm in diameter, only abundantly woolly in the crown of younger plants, very soon quite bare, undoubtedly sunken. Radial spines up to 12, the lower and upper obliquely splayed, the central ones spread out flatter, the odd lowermost the longest (on some plants up to 7.5 cm long), the next up to 5 cm, the uppermost three often only 1 cm long or less. Central spines generally 4, of which quite plainly often only the lowermost is usually projecting straight out, or obliquely upwards, or curved; this is up to 5 cm long, the upper three up to 3 cm long. The central spines stand in a cross, of which both sideways directed spines are generally the shortest. All spines are more or less markedly needle-like, flexible, at the crown transparent horn-brown or somewhat reddish, paler at the base; later they become more chalky yellowish to browny grey, but always remaining relatively pale often with darker, occasionally blackish, transparent tips. The spines are often bent away from the body. Cephalium flat, about 4.5 cm in diameter, white woolly, sprinkled throughout with barely projecting ruby red bristles.

Melocactus oreas grows in its habitat in the fissures in the granite rock in company with another species of Melocactus not yet described by me. It is extraordinarily characteristic on account of its long, thin, and flexible yellowish to reddish-brown spines. Miquel also indicates the vicinity of Bahia (Sao Salvador) as the habitat. Whether M.ernestii Vaupel also belongs here, as Britton & Rose assert, appears to me to be doubtful. The latter was met with further into the interior of Bahia, but unfortunately it was described only on the basis of a photographic illustration, since the author put forward neither living nor herbarium material.

The plants imported by myself in 1932 have developed normally up till now. The species name oreas signifies mountain-nymph and may refer to the habitat.

.....from H.Middleditch

The radial spines on M.oreas are described by Werdermann as long, thin, and flexible, 12 in number. Long, thin, and flexible may have appeared to be feeble to Lemaire, in comparison with the robust spination borne by the West indian Melocacti better known at that time, but twelve radial spines does not seem to me to pass for Lemaire's "few". Nor does "generally four central spines" seem to compare well with Lemaire's eight. At 7.5 cm (3 inches) long, the longest spine is indeed longer than Lemaire's description might suggest. The location at Bananeiras is no great distance inland from Bahia and thus lies in the general area from which the original M.oreas was stated to originate.

MELOCACTUS OREAS By A.F.H.Buining
Translated by H.Middleditch from Buxbaum-Krainz, Die Kakteen 1973

Body solitary, pretty well globular, running up to flat conical above, up to 12 cm high and wide, pale green. Roots long, fairly superficially branched. Ribs about 16, fairly rounded, up to 1.5 cm high and wide, barely projecting between areoles. Areoles 10-15 mm apart, round, 5-6 mm in diameter, sunk into the ribs, white woolly at first, later with very short grey felt, or bare, spines more or less curved, hard, stiff, sharp, flexible, horn coloured, tipped pale brown, stronger spines with bulbous thickening at base. Radial spines about 9, one 7 mm [sic!] long directed straight downwards, above that one pair sideways and obliquely downwards about 35 mm long, then two pairs sideways, more horizontal, about 26 mm long, finally one pair sideways and obliquely upwards about 10 mm long; at the top of the areole often two additional spines 5 mm long, irregularly bent. Central spines 4, one standing straight out and 40 mm long. Cephalium arched, about 4.5 cm in

diameter, with white wool interspersed with reddish bristles.

Flower .... Fruit elongated club-shaped, 28 mm long, up to 6 mm broad, somewhat curved, lustrous, red, with white spongy pulp containing the seed.

Habitat - near Bananeiras, a fair distance from Sao Salvador, on rocks, often together with M.salvadorensis and small Bromeliads. General distribution: southwest of Sao Salvador.

.....from H.Middleditch

Nine radial spines does not appear to be a close approach to Lemaire's "few", nor do four central spines seem to be a match for Lemaire's eight. Is the "7mm" length of the lowest radial spine a misprint for 70mm? This length would hardly match the "feeble" of Lemaire in Miquel, either, but it compares favourably with the longest spine length quoted by Werdermann. It would appear that Buining has taken note of the habitat location quoted by Werdermann and then set out to view and describe a plant from near Bananeiras.

MELOCACTUS ERNESTII By F.Vaupel
Translated by H.Middleditch from M.f.K. 1920

Among the botanical estate of Ernst Ule there was found, amongst other things, two photographs of a Melocactus which are so clear and adequate that it was accordingly possible to readily identify and describe the plant, even though other material was not available. Both pictures carry on the reverse a note written by Ule "Cabeca de Frade from Rio de Contas" This river empties itself into the Atlantic Ocean about 180 km south of Bahia.

[From Latin] Body almost conical. Ribs about ten, acute. Areoles 12 in each rib. Spines about 10 of which one is exceedingly long. Cephalium short cylindrical, bristly.

[From German] The fully grown plant is of conical shape. Ribs about 10, deep, acute, slightly spiralled and hummocked. Areoles about 12 on each rib; spines fairly numerous, about 10; they are distinguished by the three lowermost radial spines extending in length far beyond the others, but one more especially which is longer than half the length of the whole plant. The crown is robust, truncated-conical, in the older parts thickly scattered with bristles which project out of it. Only at the apex are the bristles immersed in the wool. The flowers are pretty conspicuous. The fruit is nothing special.

.....from A.F.H.Buining, C.& S.J.U.S. XLVI 1974,

Britton and Rose placed M.ernestii as a synonym to Melocactus oreas. Dr.Rose found his plant in the collection of Dr.Zehntner at Juazeiro and collected it later on at Machado Portella, so it is certain that he only saw and collected M.ernestii and not M.oreas, for they are quite different. ... A very characteristic feature of Melocactus ernestii is the extremely long radial spine pointing downwards. Old plants have a relatively long cephalium. ... as with most of the Melocactus, they grow in large groups on bare rocks in the bushy catinga, or sertao. ... It grows over a wide area between the 14th to almost the 13th degree of south latitude and between the 40th and 41st degree of west latitude.

.....from H.Middleditch

Since Buining had already described M.oreas with spines up to 7 cm long in 1973 (see above) it is not clear how M.oreas is so different from M.ernestii, unless the latter has markedly longer spines still.

.....from A.F.H.Buining, Krainz & Buxbaum Die Kakteen I.VIII.1974

For his part Dr.Rose found in the collection of Dr.Leo Zehntner in Juazeiro, Bahia, Brazil, a Melocactus of which he later collected a specimen near Machado Portella in Bahia. He identified these plants incorrectly as Cactus oreas (Syn. Melocactus oreas Miquel). According to Rose these plants occur on hills in the interior of Bahia. It can be supposed that he did not go along the Rio de Contas otherwise he would surely have mentioned it. The same goes for Backeberg for his statement only accepts that of Vaupel. It is not clear why he gives on his p.2567 a footnote to his key to the effect that M.ernestii, from its habit, belongs under M.zehntneri. Werdermann must have crossed over the Rio de Contas near Jequie, according to his map in "Brazil and its columnar cacti", but he did not collect there the M.ernestii occurring in this vicinity, which remained lost up to the present time.

For that reason I resolved to seek out the habitat location on the Rio de Contas and to thoroughly investigate the area there. In 1967 Leopold Horst found near Jequie his long spined H.182, of which we had collected a similar one together on 27 December 1966, but had not given it a number. Horst and Uebelmann found the same species early in 1968 at another place near Jequie and provisionally named this plant Melocactus uebelmannianus. In the summer of 1968 Horst and I were again at this spot and we established that this species occurred a fair way both to the north and south of Jequie, along the main highway. The suspicion already arose at that time that this species could be the lost Melocactus ernestii Vaupel.

On my third trip to Brazil in 1972 I studied in detail maps and literature about this country, and as Horst and I arrived in the area of Jequie, we were able to put my plan into effect, to travel broadly over a zone along the Rio de Contas. On the north bank of the river, west of Jequie, we found to our surprise the H.182 at several places on pretty steep, bare rocks; moreover we collected it further to the north, as far as Machado Portella, but not any more once we were beyond that town.

The opportunity was also presented to us to get into the area around the mouth of the Rio de Contas, which lies somewhat north of Ilheus, in order to establish whether Melocactus ernestii and other cactus species occur there. Here is to be found the extensive cocao growing zone and the cacao trees stand here sheltered in huge forests, often completely covered with epiphytic cacti, bromeliads, and orchids. The first mountain arose shortly before Jequie and this harboured H.182 on its bare slopes. Thus the distribution area of Melocactus ernestii was determined with certainty since these occur along the Rio de Contas as only long-spined ones, never any with short spines. It grows therefore in the mountains as far as ca. 100 km to the west and 30 km to the east of Jequie, over a breadth of some 70 km along the Rio de Contas. The habitat location data from Ule was thus correct, whilst on the other hand the appearance of both his plants in the illustration are only partly inclined to conform with the specimens growing in habitat. This can be accounted for not only by the long drawn-out dry season in Bahia, in the course of which the cacti shrink noticeably, but also due to the protracted journey undertaken by Ule, during which he possibly dragged the plants round with him for months. Hence the very thin specimens with their still better preserved cephalia.

Description on the basis of habitat specimens: Body solitary, up to 20 cm and more high, up to 20 cm in diameter, tapering conically above, green to pale green, with long, branched roots. Cephalium up to 18 cm long, up to 6.5 cm broad, with white wool and very numerous, fairly short, dark red spines which mainly predominate on the sides. Ribs 10-12,

pretty blunt, somewhat heightened between areoles. Areoles oval, ca. 11 mm long 9 mm wide, at first with white to pale cream coloured wool, later with grey to dark grey felt and finally bare, ca. 1 to 2 cm apart, somewhat sunken into the ribs. Spines yellowish to pale red at first, reddish and swollen at the base, later matt yellow to grey-brown, more angular than the young spines and less swollen at the base, until on old plants with a fairly large cephalium the spines are dark grey to black, all more or less curved, flexible. Radial spines 11-15, one directed downwards and up to 15 cm long, the remainder radiating sideways, of which 2 are more or less pointing downwards, arranged around the central spines, 1 to 8.5 cm long, often some additional spines in the upper part of the areole. Central spines 4, generally positioned in a cross, one directed downwards ca. 8 cm long, the remainder 2 to 4.5 cm long. Flowers.... Fruit clubshape, ca. 16 mm long, up to 7mm thick, bright violet red.

.....from H.Middleditch

Effectively, Buining regards the distribution area of M.ernestii as the lower basin of the R. de Contas, centred on Jequie. It appears that Buining distinguishes M.ernestii by the longest spine being about twice as long as on M.oreas, and the fruit on M.oreas is nearly twice as long as the fruit on M.ernestii.

.....from N.Taylor, Bradleya 9.1991

Melocactus oreas, lowermost radial spine 40-80 mm long, fruit 14-28 mm long; Melocactus ernestii, lowermost radial spine 50-150 mm long, fruit 14 - 45 mm long.

.....from F.Ritter, Kakteen in Sudamerika Vol.1

Melocactus ernestii. This species was published by Vaupel on the basis of two photographs taken by Ernst Ule and it remained lost until Buining, on a search for it, found it once again in the vicinity of Jequie on the R.Contas. Like M.nitidus, with which it is closely related, it grows on almost bare rocks. The distribution is given by Buining as between latitudes 13 & 14 and longitudes 40 & 41. The spines are the longest among the Melocactus. A precise description which supplements that of Vaupel was given by Buining & Brederoo in Krainz “Die Kakteen”. The differences in comparison with Melocactus nitidus are evident from the descriptions and photographs e.g. Melocactus ernestii has roughly 12 areoles per rib, Melocactus nitidus has 6 or 7.

NOT ONLY MELOCACTUS LONGISPINUS From F.Vandenbroeck

I am glad to be able to say that in 1989 I was able to make a successful and satisfying trip through north-eastern Brazil during the months of July and August. This trip extended for almost exactly 10,000 km. Starting at Rio de Janeiro, we zig-zagged through Minas Gerais to Bom Jesus de Lapa on the Rio Sao Francisco, from where we crossed that river into western Bahia. After visiting Seabra and Morro de Chapeau we touched the Rio Sao Francisco again at Xique-Xique and then at Juazeiro, the northernmost point of our trip. Our return route took us through Salvador, Vitoria de Conquista and Governador Valdares, with a visit to Cabo Frio before we finally came back to Rio de Janeiro. It was the first time I had been in Brazil and I must admit that it was quite an experience. The countryside, vegetation, people and climate differ markedly from the other parts of South America which we have visited.

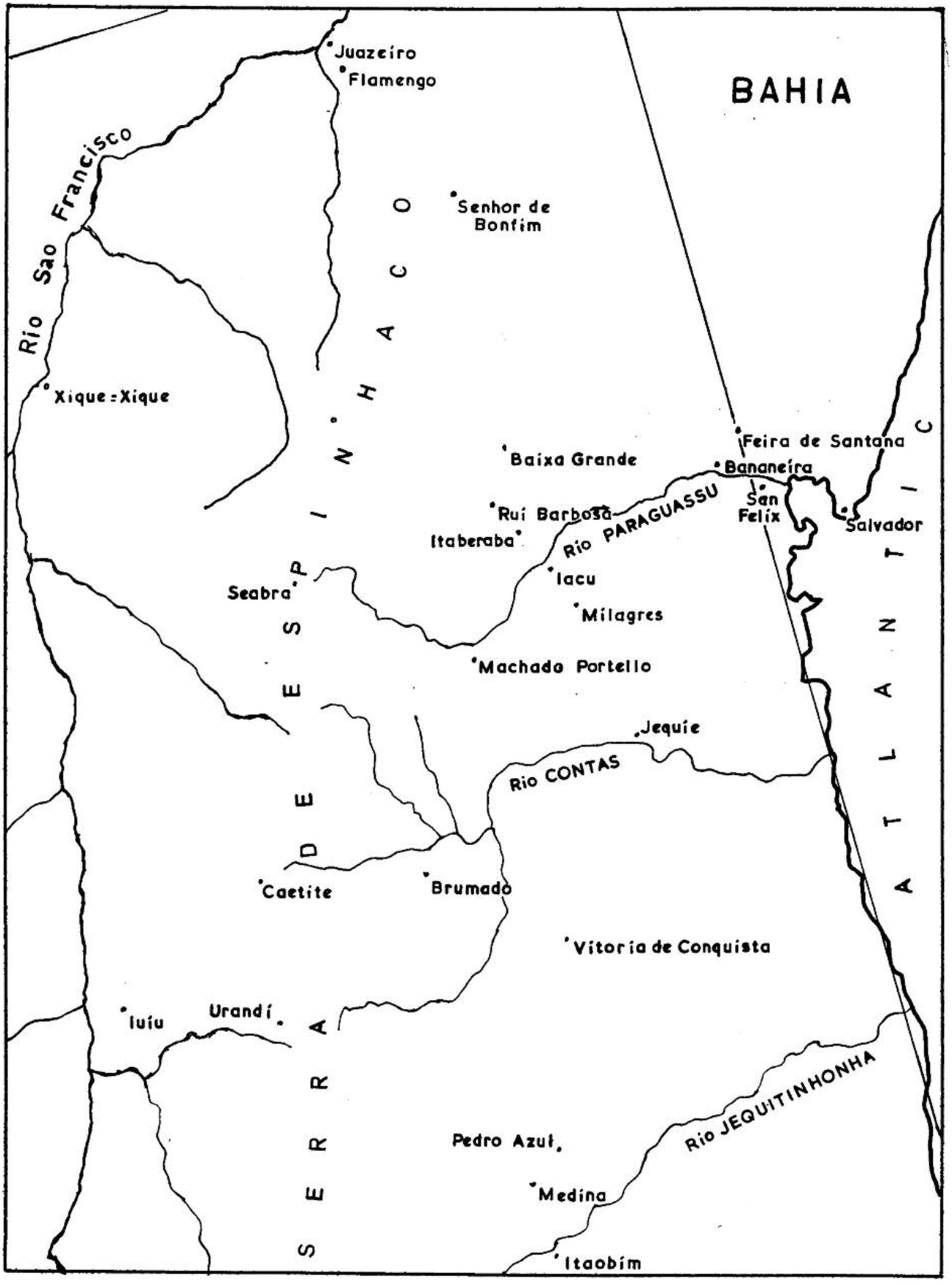
The Brazilian cacti are also mostly unique in appearance. Typical of course is the fact that most species bear a cephalium or a pseudo-cephalium, often very colourful, which greatly adds to the beauty and attraction of the plants. Another aspect of Brazilian cacti is their very limited local distribution. Like in Paraguay, looking for the cacti in Brazil is rather like searching for a needle in a haystack. I was most fortunate as to be informed before our departure about the precise habitat locations for several species by a friend who had already made two trips to Brazil, but even then I missed the spot and the plants in question on more than one occasion. Plant sites are especially difficult to find west of the River Sao Francisco.

I was fortunate enough to see a fair number of Melocactus species, often impressive and beautiful plants in attractive habitats. However my own impression is that different species of Melocactus rarely grow together in one and the same population. Wherever this is the case then the second species is a representative of the M.bahiensis group and occurs only sparsely. On the other hand, specimens of the same species may vary widely within the same population. This variability is closely linked with the age of the plants. Take Melocactus longispinus, for example. There is no doubt that if a middle age specimen and an old specimen were isolated and presented to anyone showing interest in these plants, they would be judged as two completely different species. It is really striking how Melocactus can change or vary in accordance with its age. The effect of this phenomenon is, of course, that in one and the same population where you have all possible degrees of age together, the plants show a wide variation in spine colour, length of spines, colour of body, size, length of cephalium, and so on. This is probably one of the reasons why, in the past, many different species were often thought to be growing together.

Most populations of Melocactus occur on isolated habitats surrounded by areas where the plants cannot survive. These habitats may be flat rocky ledges amidst the bushes of the caatinga. Or they may be steep rounded limestone rocks like small mountains; these limestone rocks have a blackish appearance which is due to the lichens and algae which cover the rock with their dark coloration. These rocks often have the shape of a “sugar-loaf”, they occur isolated one from the other, and are quite typical for some areas in eastern Brazil. I was not unfamiliar with this type of mountain as I first saw them many years ago, rising above the forest in Surinam.

There are a few species of Melocactus which seem to be less fastidious as to their habitat. This applies to M.zehntneri and to some forms (or varieties or species) of the M.bahiensis group. We often found these plants spread over large areas, in sandy soil in the caatinga, often even in the vicinity of human settlements. Then there is M.melocactoides (violaceus) which grows in the sand dunes along the Atlantic coast.

The populations growing on the isolated rocky outcrops are, in most cases, condemned to inbreeding. Ritter correctly oberves that if a population on such a habitat were eradicated, the species would never (or perhaps exceptionally) be able to recolonise that particular habitat again. He explains the different isolated habitats of plants which are clearly related - or which can be considered as one and the same species - by earlier climatic conditions which allowed cacti and xerophytes a more abundant and less isolated distribution and consequently an easier and freer opportunity to spread. The present day habitats may be looked upon as isolated refuges for the cacti. The fact that many populations of plants that may be closely related have lost contact with each other, is very significant. For example, between Iacu and Milagres we studied plants of M.longispinus on two different habitats. The rocky hills were not even 10 km apart from each other. It was evident that both populations belonged to the same type of plants, but it was equally clear that there were differences. In fact it could be stated that due to a large degree of inbreeding, each habitat has its own typical plants. This still leaves open the question of form, variety, or species.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Rio JEQUITINHONHA
Pedro Azul
Medina
Itaobim

Many of the original descriptions of Melocactus species are very deficient in detail, but even the more recent descriptions such as those of Buining and Brederoo are lacking in essentials. Take for example the description of Melocactus longispinus which in my eyes is worthless because it completely neglects the variability of this species. The description mentions a cephalium height of 9 cm. This has no sense as there is a variation of cephalia between 0.5 up to 30 cm. Furthermore, no mention is made of the juvenile and adult spination forms.

The eventual length of the cephalium is determined by the species. The most impressive cephaliums we saw were on M.longispinus. By comparison, south of Xique Xique, M.giganteus displayed cephaliums of only up to 3 or 4 cm tall.
.....from H.Middleditch

Yet the description of M.giganteus Buining & Brederoo in C & S.J. U.S. XLV. 1973 includes a photograph of two specimens with strikingly elongated cephalia. In the text the length of the cephalium on this species is stated to be "up to 26 cm long".

ONLY MELOCACTUS OREAS ? From K.Preston-Mafham (Chileans 1989 Weekend)

We arrived in Brazil at Rio de Janeiro and after settling in we made a day trip up the coast to Cabo Frio. We then took a trip up to Belo Horizonte and Grao Mogol. The backbone of the Sierra Espinhaco is full of Pilosocereus, Melocactus, and Buiningia, but it is very difficult of access. From Grao Mogol we went over to the coast and up to Bahia, to look at the Melocacti on the sand dunes. From there we went down to Milagres and the Rio de Contas area. This is not a difficult area to get at, it is only a day's drive to and from here out of Bahia.

Near Jequie we came across Melocacti. These plants are spread around on isolated patches of rock. At first I thought that this rock was granite, but it is not - all these patches of rock are limestone. Hereabouts almost every bit of rock has some Melocactus on it. Some of these patches of rock are barely the size of a table tennis table, but they will still have Melocactus on them. I was surprised and gratified to see how many there were. There were a great many seedling plants around, so they obviously seed and survive extremely well, but sorting them out into species is a real problem. You can see that it is the lowermost spine which is the longest, so M.ernestii is a possible name for these. In my opinion there is a cline from this sort to M.oreas which is the other name for ernestii and longispinus. Near Milagres we came across more Melocacti, which was not very different from the longispinus/ernestii (oreas) we had already seen. There will probably be Melocactus growing on rocky slabs here and there all the way from Jequie to Milagres. They are undoubtedly common in this area.

There were also some M.zehntneri around and you could always recognise this species - the ecology was different. If it was growing off the rocks and in the normal caatinga soil you could say straight away that it was zehntneri. Also it had a little white centre to the flower, a matt green body, and not a large cephalium. But at one spot we did find only a dozen plants with a glaucous body and sharp ribs of zehntneri, and no long bottom radial, so the spination was also like zehntneri - but with a large cephalium! At one spot near Jequie we found a number of plants, some with a glossy green body, which might have been hybrids between zehntneri and the longer spines sorts - either that or these were a separate species of which there were only a few examples here, which I find difficult to believe. In my opinion there were very few hybrids to be seen.
.....from H.Middleditch

The slides shown to us by K.Preston-Mafham of the Melocactus from Jequie had spination fairly similar to those illustrated in Succulenta, as HU 166 and J.Hoeven's picture of M.ernestii. Perhaps we could seek views on its identity from others who have seen these plants in habitat?
.....from W.Strecker

I am fairly certain that the picture by K.Preston-Mafham is of M.ernestii, especially since the photograph was taken in the vicinity of Jequie. Certainly I am also aware from my three visits to this area, that there are a very large number of transition forms from M.longispinus (HU 435) up to M.ernestii. For Brazilian conditions the habitats are not all that far from one another. Even at the places stated to be the "Type location" one can find side by side Melocacti of various forms with spines of average-length up to very long, which in addition vary from yellow to dark brown. I do not know for certain the type location for M.oreas. For this reason I am not absolutely sure whether we found the correct location in 1981. Collected seed has been sold under this name by Hovens in the Netherlands, but I could not say for certain whether this name is correct.

BRAZIL, LAND OF THE CEPHALIUM BEARERS. By Carla Wolters.
Translated by W.W.Atkinson from Succulenta 70.1.1991

24 July; Yesterday 350 km travelled. An 0730 departure from Baixa Grande. We left in dark, cloudy, weather. There was clearly mischief in the air. On to Macajuba. Gradually it became greener and fresher. We made our first finds in this area, a Melocactus, probably belonging to the rubrisaetosus complex. We followed the road to Rui Barbosa, passing the black and white chequered jacket of one or other of the poisonous snakes, seemingly in suspended animation. The scenery became more and more jungle-like and we expected to come across anything but cacti here, when our eyes fell upon the presence of Pilosocereus pentaedrophus and Brasilicereus phaecanthus! Unimaginable that they can feel at home here in this thick jungle, Rui Barbosa is, with apologies, another foul stinking hole. We were lucky; this day's route led us over perfectly asphalted roads except for the last 40 km when we had to detour to Itaberaba.

A biotype, although not altogether natural, deserved further explanation. A biotype of restricted extent on a rocky plateau had expanded itself into a nearby waterbasin, where a good foothold had been found on the piled-up stone walls by the subsequent growths. The more so because the compacting nourishment was enriched by the droppings of alighting birds. Lucky conditions for an (unknown) Melocactus which by classic norms belongs on an exposed black patch with many Dyckias or Hechtias, the (everywhere present) Cereus jamacaru, and a single Euphorbia-like plant. Here we found Bromeliads: Neoregalia sp. and Bromelia serra, the latter just in flower.

Out of a sort of courtesy towards strangers, one gets the idea that the reaction to one's questions is always "yes" whilst afterwards the opposite seems to have been the case. Annoying. In Itaberaba we first obtained fruit, bread, jam, and so forth. We yearned for cheese, but this was nowhere to be found.

From Itaberaba, Iacu-wards. We undertook the necessary ramblings in the surrounding caatinga area where we repeatedly perceived forms of Melocactus iacuensis, as also the widespread M.salvadorensis. Often in brotherly harmony.

A well-known feathered friend in the sertao is a bright orange bird with black stripes which gave out a distinctive call. Alas, its name is unknown to us, but because of its decorative appearance it is not unknown to the bird-catchers. They build two types of nest: dome shaped mud structures the size of a small football on trees, high-tension electric wires, etc., and a fairly large tubular twig nest often hanging on the weakest branch of a tree! Does anyone have suggestions for its identification? Everywhere the lizards that speed through water, although yesterday I was lucky enough to get one on film. We drove about 30 km southwards from Iacu, and here we still have M.rubrisaetosus which now in the afternoon had their miniscule flowers fully open, surrounded by little groups of Selaginella. Also worth mentioning are the Opuntias with their display of comic orange fruits.

We returned via Iacu to Milagres, to find, just before sunset, a habitat of the unmistakable Melocactus longispinus. This became the last strenuous walk for the day, to the foot of the mountain, and then began the scramble to the top. We were partially rewarded: fantastically large specimens of M.longispinus, but they were sparse, and one could ask oneself if the sacrifices were worth-while. We were plagued with hundreds of tiny flies and those leg-strangling snake-plants, not to mention the razor-sharp but oh! so beautiful Bromelias (they are proverbially an indication of the nearby presence of cacti!). This peak was conquered alright, but the vegetation on top seemed to be relatively sparse, to our disappointment.

It was high time to get back to Milagres to look out an overnight address called a “pousado”, a sort of motel with sleeping accommodation only. Here, after a (too) hot shower, we found a nearby restaurant, to replenish the reserves and to muse over the experiences of yet another cactus-hunting day.

25 July; Did 227 km yesterday. Departure from Milagres around 0715 and a relative humidity of 100%. This had to be without breakfast, which we catch up on in the adjacent village. Today we hope to find a more accessible habitat area of Melocactus longispinus. At the first stop, just outside Milagres, however, we found not the desired species, but an easily walkable terrain richly endowed with Melocactus of the rubrisaetosus complex. The second stop, still more; to the left, the hill ridge promised a golden chance. We parked by the roadside, just as a gaucho walked past seeking a lift.

We tested our good luck and it was a good shot. After a long pull through grassland, the massif opened up. Enormous numbers of Melocactus longispinus around. Where yesterday we had to make enormous sacrifices for just a handful of plants, here perfect specimens competed with each other in their beauty. We lingered here a while. An acute diarrhoea among the ranks induced a retreat. What did we see? The gaucho still by the roadside, his thumb in the air: we gave him a lift to Milagres.

Melocactus rubrisaetosus Habitat; very flat plateau, very sparse, alongside road BA 046. Biotype; on brownish granite rocks, by preference in the shelter of prevalent yellow bronzed Bromelia species. Also hereabouts is humus and rotted Bromelia debris, of benefit to other vegetation. Rock fissures also used as growing places. Large population. Neither seeds nor flowers confirmed.

Melocactus longispinus Locality: from Milagres back towards Iacu on the BA 046, on the steep sides of a range of hills approached via several hundred metres of meadowland. Biotype: On this south side (sunny side) were growing masses of specimens on a seemingly still undisturbed hill area, and where big variations within the species were evident. One plant lovelier than the next, often with fabulous spination. A seedling e.g. with a body diameter of 6 cm, but 32 cm over the spines! A unique phenomena were the the cephalia, up to 50 cm high, topheavy and wobbly old specimens. Body sometimes spherical, sometimes elongated, when they often sheltered a grass-fine tillandsia. Other Bromeliad spp. hung profusely in the few low shrubs that the plateau supported. A silverwhite cluster of Tillandsia gardneri was anchored firmly to the shaded side of enormous rocks almost out of reach and on the point of opening their pink inflorescence.

Various equally interesting Euphorbias were not lacking in this display, amongst which was pencil thin Euphorbia of the sipolisii affinity. Everything pointed to a very humid area, and not least significant were the magnificent and colourful lichens. One of the highspots of richness and variety. Also Pilosocereus gounellei.

Here and there a few seed collected; no sight of bloom. Plants were generally on the lean side because of the continuing drought. In the grassland leading to this unforgettable Biotype, we were surprised to see Passiflora caerulae creeping through the grass like a snake plant, with blue-white flowers.

MELOCACTUS LONGISPINUS Buining & Brederoo
Translated by H.Middleditch from Succulenta 55.6.1977

Body solitary, somewhat elongated, up to 25 cm high without cephalium and about 13 cm in diameter, dark green with ramified roots. Cephalium up to 9 cm high and up to 6 cm in diameter, furnished with white wool and numerous short red bristles, which dominate the cephalium and give it a red appearance. Young plants are initially almost spherical, but later they become oval and finally into a conical apex, so that the top has the same diameter as the cephalium itself. Ribs 11, fairly blunt, 4 cm broad at the base of the plant, 4 cm from each other and 2.5 cm high, at the top right under the cephalium the ribs are 1.5 cm apart 1.5 cm broad and up to 1 cm high, between the areoles they are somewhat humped, especially right above the areole.

Areoles round to oval 9 mm long 6 mm wide, furnished with light grey felt, older areoles darker and barer. There are 4 central spines, of which one points straight forward, 80-90 mm long, 1 pair pointing sideways 25-30 mm long, and 1 points obliquely downwards 35 mm long; 7 radial spines of which 1 points almost downwards 120 mm long, 1 pair point obliquely upwards 50 mm long, 1 pair stand horizontal 30 mm long and one pair point obliquely upwards, 10-15 mm long. All spines are more or less curved, needle shaped; old spines dark horn coloured with red bloom; at the foot they are somewhat bulbous, this swelling being reddish coloured. Flowers ... Fruit club-shape, up to 35 mm long, 10 mm thick, carmine running down through pale pink to white. Seed ....

Habitat to the east of Lacu [sic] to the southeast of the Rio Paraguacu, at an altitude of around 320 m, on bare rocks, together with an Opuntia sp., Pseudopilosocereus gounellii, Stephanocereus leucostele, a golden yellow species of Bromelia and another Melocactus species. Holotype in Herbarium Utrecht under number H.435. Buining and Horst were at the habitat location on 23 June 1974.

.....from H.Middleditch

Presumably Lacu is a misprint for Iacu. This place lies a few km to the south of the R.Paraguassu whilst Itaberaba lies some 40km to the northwest, on the opposite side of the river.

.....from F.Vandenbroeck

In my view, the description of M.longispinus as published in Succulenta, is defective. The plants are described as “slightly funnel-like” and with a cephalium “up to 9 cm tall”. As I saw it, M.longispinus in its typical mature form is conspicuously funnel-like with a cephalium which may surpass 30 cm in length! However, the description in Succulenta

may well be based on some younger specimen in culture. At the habitat of M.longispinus I took a picture of three plants growing side by side, of which each specimen happened to represent a different stage of maturity. It is a splendid illustration of the variability of the species.

As to the differences between M.longispinus and M.ernestii, I can say in general terms that M.longispinus is a more slender and elegant plant than M.ernestii which grows into very robust dark green, broadly-ribbed specimens. The body of M.ernestii has a more globular shape whereas M.longispinus grows more funnel-like. Both species may develop a very elongated cephalium, but M.longispinus shows the longer. The habitats of both species are very similar, being on rounded, bare, rocky slopes, and the plants themselves are very variable. However, I do not believe I have seen M.ernestii and M.longispinus growing together.

We did find one remarkable phenomenon, a population of M.longispinus of which many adult plants formed large off-shoots besides the cephalium so that the plant developed into a somewhat monstrose form. The original head never showed any signs of damage, and the offsets also formed cephaliums.

MELOCACTUS RUBRISAETOSUS Buining & Brederoo
Translated by H.Middleditch from Succulenta 56.7.1977

Plant solitary, 15-18 cm in diameter, 11 cm tall to underside of cephalium, dark green with ramified roots; cephalium 6 to 6.5 cm in diameter, about 3 cm tall, with white to cream coloured wool and many short red bristles, which convey a red look to the cephalium. Ribs 13-14 somewhat rounded, 3 to 3.5 cm wide at the base, 2 to 2.5 cm high, not or scarcely humped and sharp there. Areoles at first 9 mm wide and 10 mm long, slightly sunken into the rib, about 1.3 to 1.5 cm apart along the rib. Spines red at first, then reddish grey and later grey; radial spines 7 of which the lowermost points downwards up to 80 mm long, then 1 pair pointing obliquely sideways and downwards 35-40 mm long, 1 pair 28-30 mm long horizontally sideways and one pair 25 mm long pointing obliquely sideways and upwards. These spines are 1 mm thick and are not or slightly swollen at the base; central spines 4, arranged in a cross, more or less swollen to 2 mm at the base, the lowermost 35-45 mm long pointing downwards, both sideways pointing ones 22 mm long and the uppermost 20 mm long, all flexible; at the top of the areole still 2-3 spinelets 10-12 mm long. Flower ... Fruit conical, 16 mm long, thickest width 6.5 mm, uppermost part red, purple below shading into pale purple, lowest point almost white. Seed ....

Type location near Milagres, Bahia, in clefts or pockets in bare exposed rocks, where some humus has accumulated. Holotype in herbarium Utrecht under number H.137

.....from F.Vandenbroeck

What M.rubrisaetosus is, exactly, is not clear to me. In the original description, the type habitat is given as Milagres. We were at Milagres where in the immediate vicinity of the town there are rocks with lots of Melocactus. However, these plants hardly correspond with the description of M.rubrisaetosus. The plants we saw were about 20 cm tall, with brownish spines, and cephaliums up to 10 cm high. The name rubrisaetosus (with reddish bristles) is of course exceedingly badly chosen as many species of Melocactus have conspicuous red bristles in their cephaliums. Before starting on our travel to Brazil, I was told that near Bravo there was a rock on which M.rubrisaetosus could be found. Bravo is situated about 50 km west of Feira de Santana, a few km to the north of the road to Itaberaba. On arriving at this particular location, we found plants which differed appreciably from those we had seen near Milagres. Near Bravo only the younger plants correspond to M.rubrisaetosus, but mature plants have globular bodies, get blackish spines, and cephaliums of 20-25 cm tall. Near Milagres adult plants displayed globular to slightly-funneliform bodies, with golden brownish spines and cephaliums up to 10 cm tall. Both species have very long lowermost radial spines. It is possible that the description of M.rubrisaetosus is based upon an immature plant.

MELOCACTUS AZULENSIS Buining & Brederoo
Translated by H.Middleditch from K.u.a.S. 28.7.1977

Plants solitary, slightly flattened globular (without cephalium) up to 9 cm high and up to 14 cm in diameter, dark green, with branched roots. The cephalium is up to 10 cm, long and up to 8 cm in diameter with white wool and numerous dark red bristles. Ribs 10, 3.5 to 4 cm broad at the base of the plant, above 1.5 cm wide and up to 3 cm high. Between the areoles the ribs are raised sharp hatchet-like. The areoles are sunk into the ribs between the hatchet like protrusions, are oval, up to 9 mm long and 6 mm wide, at first with greyish white felt, later bare and more or less 1.5 cm apart along the rib. The 4 central spines are arranged in a cross, one straight forward or pointing somewhat downwards, about 45 mm long, one pointing upwards about 25 mm long and a pair pointing obliquely sideways about 22 mm long; all spines are swollen nodule-like at the base. Of the 12 radial spines one about 70 mm long points downwards and usually with a curved tip, the remaining 11 radiate around the central spines, 10-36 mm long, the shortest at the top of the areole, in addition still 2 or 3 short spinelets at the very top of the areole; all spines are needle-like, straight to slightly curved, yellow at first, later pale brown to grey horn colour. Flowers ... Fruit 12-15 mm long, 6-7 mm thick, red at the top, more purple below, running through pale purple into pink. Seed ...

Habitat near Pedra Azul, N.E. Minas Gerais upon almost bare and hemispherical peaks which are coloured blue in places. It often grows here in association with Buiningia brevicylindrica. Holotype in herbarium Utrecht under No. H.168.

.....from F.Vandenbroeck

We saw plants of M.azulensis at various places around Pedra Azul. These plants are depressed globular and may develop a cephalium up to 15 cm or more. To the east of Itaobim we saw the “multiceps” form, which is , as far as I know, also considered as a form of M.azulensis Curiously enough, most of these plants develop a cephalium split up in several heads.

MELOCACTUS NITIDUS F.Ritter
Translated by H.Middleditch from Kakteen in Sudamerika Vol.1 1979.

Body spherical, occasionally slightly conical, but never cylindrical, 14-17 cm diameter, glossy grass-green. Ribs 10-12, rarely 13, some 25 mm high, with curved flanks, edges blunt and and rounded, more or less bowed outwards between areoles, usually more curved above the areoles than below. Intercostal grooves fairly straight. Areoles round to oval, white woolly, 5-13 mm long and 5-10 mm wide, 8-18 mm apart. Spines usually shiny, occasionally dull, reddish brown, often reddish yellow, not going grey. Radial spines 10-12, all round the areole, closer together above than below, stiff, but thin relative to their length, standing away from the body, straight or somewhat curved upward, sometimes several curved somewhat downwards, the lowermost the longest and normally curved upwards, sometimes downwards, often also erratically curved, 5-10 cm long, the next radial spines somewhat or noticeably shorter, but not much thinner, in general decreasing in length and thickness upwards, the uppermost usually ca. 10-15 mm long; central spines normally four in a cross, straight or somewhat curved upwards, always noticeably shorter than the lowermost radial spine, the lowermost central spine the longest, 3-6 cm long, the others barely or substantially shorter. Often there are in addition still 1-3 shorter and thinner half-radial central spines. Cephalium only 6-7 cm thick, usually 7, occasionally growing up to 12 cm high, with white wool and many fox-red bristles. Flower opens about 4 o'clock in the afternoon and closes in the evening, ... Fruit clubshape, only 12-15 mm long, ca. 6 mm thick above, the whole lower part purple, running through crimson into vermilion at the top. Seed ....

Type location. Itaobim, Minas Gerais, on flat rocks. This species grows particularly in Bahia on many scattered and isolated rocky places, usually on flat rocks. The number of ribs hardly varies in the different areas, basically the regional variability is very slight. Since Buining & Brederoo have employed my intended species name longispina for another Melocactus species, I must abandon this name and produce another species name. As the first habitat location I found this species on rocks near Flamengo, Bahia, in 1963, FR 1210.

In the east of Brazil several species of Melocactus often grow together at the same habitat location, which is very enlightening for clarification of the question what is worthy of being a species and what as a variety. There is a narrow valley near Ourives, on the railway line to the north of Brumado, where I found four different species of Melocactus growing together, all without hybridising between each other - bahiensis, inconcinnus, canescens, and a variety of macrodiscus whilst nearby a fifth species, nitidus.

The distance between the most northerly and the most southerly habitat locations known to me for M.bahiensis extends to almost 900 km. It is the most widespread of all Brazilian Melocactus. Only Melocactus nitidus has in addition a comparably extensive distribution

.....from F.Vandenbroeck

To me, M.nitidus is an enigmatical plant as I do not understand what Ritter may have meant by this name. Near Flamengo we saw only forms of M.zehntneri. Near Brumado we saw plants which probably belong to the bahiensis-group and possibly also M.canescens. The Melocactus we found in the vicinity of Iacu cannot be Ritter's M.nitidus because of the blackish spines of the older plants. Ritter says clearly about the spination of his M.nitidus that it is "nicht vergrauend". At the same habitat we indeed found some specimens of Pilosocereus gounellei (a widely distributed species) but no Zehntnerella. At the foot of the hill there were some specimens of Piptanthocereus.

.....from H.Middleditch

It would be very helpful to be able to locate Flamengo, which is not marked on any of the maps in my possession. In consequence I do not know if it has any significance, for example it may lie near the periphery of the distribution area for M.nitidus as understood by Ritter.

.....from G.Heiman, W.v.Heek, W.Strecker & R.Paul, K.u.a.S 35.7.1984

From Senhor de Bomfim we followed route 407 in the direction of Juazeiro, coming to Flamengo, about 15 km before Juazeiro.

.....from H.Middleditch

From Flamengo in the north to Itaobim in the south would appear to extend to some 800 km. This distribution area for the long-spined M.nitidus appears to cover the distribution areas occupied by the similarly long-spined M.longispinus, M.rubrisaetosus, and M.azulensis, which Ritter places on record in his Kakteen in Sudamerika, but in a manner which suggests that he has not recognised them in the field. The distinction between M.ernestii and M.nitidus made by Ritter on the basis of the number of areoles per rib appears to be open to question, in view of the comments by many field observers regarding the variability of Melocactus. In addition, the distribution area for M.nitidus Ritter also appears to conform to that attributed to M.ernestii sensu Taylor 1991. Both these authors evidently regard these widely-distributed long-spined Melocacti as one species, for which the name ernestii has priority.

MELOCACTUS INTERPOSITUS F.Ritter
Translated by H.Middleditch from Kakteen in Sudamerika Vol.1

Differs from Melocactus nitidus in: Ribs 11-14, areoles round 4-6 mm diameter, 8-12 mm apart, spines dull, brown, yellowish- or reddish- brown. Radial spines 8-10(-12), straight or curved somewhat downwards, the lowermost usually curved downwards, occasionally upwards, 3.5 to 5 (-7) cm long; central spines usually only one, projecting, straight, thick, 2-4 cm long; in addition yet another 2 or 3 smaller half-round central spines. The seeds are like those of Melocactus nitidus, different from those of Melocactus bahiensis. Type locality: Iacu, Bahia, on rocks, as the only Melocactus species there. Found by me in 1964. In outward appearance the species is similar to M.nitidus and M.bahiensis but just as the seeds prove, it stands in closer relationship to M.nitidus.

.....from F.Vandenbroeck

The plants we found near Iacu may well be Ritter's M.interpositus. Ritter speaks of this Melocactus near Iacu and from there it is only a few km further to the east where M.longispinus abounds on conspicuous rock formations. It is difficult to understand how M.longispinus remained unknown to Ritter.

.....from N.Taylor, Bradleya 9/91

Melocactus ernestii was described from photographs of plants collected along the Rio de Contas. Its occurrence in that region has been documented by Buining (1964). Even in this relatively restricted area it is extremely variable. The form which may correspond with the type collection is particularly striking, with massive, elongate stems and very long spines. At the opposite extreme is a plant described from Iacu as M.interpositus Ritter with relatively small, depressed or

globose stems and atypically short spination; lower radial spine often only 50mm. This perplexing form is sympatric with M.oreas around Iacu.

REVIEW OF MELOCACTI WITH HU NUMBERS By G.Eerkens. Succulenta 1983 - 1985 [Abstracts]

HU 112 This is as yet an undescribed sort which has the provisional name of M.multiceps. The name is based upon the multiple cephalia which the plants can produce. The spination is needle like and brown. The habitat location is Itaobim. Another provisional name is M.itamboensis.

HU 137 is Melocactus rubrisaetosus .... from one and the same plant both short and long fruits can be gathered. According to the description by Buining and Brederoo, the growing place is Milagres. Nevertheless in his HU list Buining gives the growing place as Itabiraba. It was also provisionally named as Melocactus itabirabensis and M.itaberensis.

HU 140 The provisional name for this species is Melocactus medinaensis, named after the habitat location in the vicinity of Medina. The spination is needle-like and brown. It is the selfsame as HU 112. According to Pierre Braun who has been to the habitat locations, HU 112, HU 140 and HU 168 are the selfsame species, which I also consider to be correct. The correct name for all three is Melocactus azulensis Buining & Brederoo.

HU 166 had the provisional name of Melocactus iacuensis, quite obviously named after Iacu, Bahia. According to data from Buining, the growing place is really Milagres. Young plants are brown spined. In the description of his M.interpositus, Ritter gives Iacu as the habitat location.

HU 168 was published as Melocactus azulensis by Buining & Brederoo in 1977. The spination of this species displays no difference to that of HU 112 and HU 140. The growing place is Pedra Azul, so that the plant is named after its habitat location. Ritter published a Melocactus nitidus with Itaobim as habitat. It also belongs here. The correct name then becomes M.azulensis Buining & Brederoo.

HU 435 This sort was described as Melocactus longispinus Buining & Brederoo in 1977, not to be confused with the provisional name of Melocactus longicarpus HU 149. It is a fine species with very long needle-like spination, readily distinguishable from Melocactus ernestii. The finding place is to the east of Iacu, about 52 km to the south of Itabiraba, to the southeast of the Rio Paraguacu, where it grows together with yet another Melocactus, which is very probably HU 436.

.....from H.Middleditch

In the December 1983 part of this review of Melocacti with HU numbers, there appeared two habitat photographs of long-spined Melocacti, one of HU 166 taken by Buining near Iacu, the other taken by J.Hoevens but without location. As far as one can judge from these two photographs, there is little doubt that some of the radial spines are fairly robust but there are equally a good number of radial spines which could fairly be described as thin and feeble. By comparison, what appear at first to be central spines are very definitely a great deal longer and of a thickness equal to the more robust radial spines. However, bearing in mind that it is the lowermost radial spine that is commonly the longest on Melocacti, it is quite probable that this would prove to be the case by examining these two plants in the hand, as opposed to on a photograph. But was “the lowermost radial is the longest” an accepted feature of Melocacti in Lemaire’s time? In 1839 there were rarely any sketches of a spine clump on individual areoles, such as we are familiar with today from e.g. Brederoo or Brandt, and none for Melocacti that I am aware of. I am prepared to accept that if either the Buining HU 166 or the J.Hoevens’ plant had been put in front of Lemaire, his reaction would not have been greatly dissimilar to my own first impression i.e. about eight long, strong centrals, the radials mostly short and slender.

.....from D.Angus

My two seedling plants of Melocactus ernestii are really too small to display their mature features. Nevertheless they do have 11 ribs and their spination is straight, none of the waviness that catches the eye on the spines of my M. itaberensis. Certainly on M.itaberensis it is the lowermost radial spine which is much longer than all the rest, up to three inches long, definitely not straight, but curved and twisted to varying degrees, often with a curved tip. It is fairly easy to pick out one strong central spine, but it is very difficult to decide if any other spines can be called centrals. Perhaps the two short, fine, spines which are above the obvious central and lie within the ring of radial spines might be classed as centrals. Discounting these, there are 7 or 8 radial spines. The cephalium looks white to me, even though it does have a great many compact bunches of red spines which do project a short way above the white cephalium wool. I would not have said that the cephalium had a red look about it. This plant was a flattish, bun-like shape when I obtained it, but now the upper part has taken on a rather more conical appearance. Even though no more areoles are produced once the cephalium appears, I am quite convinced that, like all other Melocacti, this one has increased appreciably in volume.

.....from F.Vandenbroeck

An interesting feature in the growing process of Melocacti is the fact that the volume of the plant body may shrink during the development of the cephalium. I noticed this on several occasions, but I remember it very clearly in one instance. Near Iuiu we found a typical large growing Melocactus. In this population I recollect two plants growing side by side of which the younger specimen without a single trace as yet of the cephalium, was about 10 cm taller than the body of the adult plant. One might be tempted to assume that part of the energy of the plant body is consumed by the development process of the cephalium.

.... from H.Middleditch

The Buining article on M.ernestii in the Buxbaum-Krainz Die Kakteen, which is reproduced above, includes a photograph of two plants in habitat, one with a cephalium and one without. Of these two plants, Buining observes that the younger plant without cephalium has “very long spines”. At first glance, the cephalium bearing plant appears to have much shorter spination, but this impression arises to some extent from the young plant reflecting light from its spines so that the long spine length is self-evident. The spination on the cephalium bearing plant may be older and duller and not reflecting the incident light, or it may be partially shaded; whatever may be the cause, it is necessary to scrutinise the photograph carefully in order to make out the actual length of the longer spines on the mature plant. They appear to be shorter than on the young plant, but not exceedingly short.

.....from A.W.Craig

But how can the spines get any shorter just because a plant grows older?

.....from H.Middleditch

There is no explanation forthcoming from Buining. He does not even suggest that when the long-spined young plant eventually bears a cephalium that it will still have longer spines than the cephalium bearing plant currently growing

alongside. However, one of the photographs taken by K.Preston-Mafham of a Melocactus growing near Jequie (shown at the Chileans' Weekend) is of a plant with a cephalium taller than it is thick, so the plant must be a fair old age. The spination towards the top of the plant appears to be shorter all round than the spines which grew when the plant was younger. A similar sort of variation is illustrated by Brederoo in the original description of M.rubrisaetosus with a sketch of two spine clusters; one cluster has the lowermost radial spine half as long again as on the other areole. Is the longer spine on a young areole, and the shorter 'long' spine on an old areole? There is no explanation in the text for this difference.

.....from F.Vandenbroeck

The variation in the length of spines is mainly determined by the age of the plants. Younger plants have long, flexible, colourful spines. Older plants display withered brittle and blackish spines. In between there are all degrees of transition. I think we can compare this phenomenon with human hair-growth - lush and dense in youth, withered and sparse in old age. Nevertheless, long-spined Melocacti always keep looking long spined, whatever their age.

.....from H.Middleditch

It was noted by Taylor (1991) that the spines on M.ernestii are often red-and-yellow banded, whereas on M.oreas the spines are not so banded. It might be assumed that this is intended to refer to cross-banding, since there is hardly room on the spine for longitudinal banding. Has this been observed on any plants in cultivation?

.....from R.Moreton

The only mature Melocactus which I have from this long-spined group is M.azulensis HU 112. The central spines are up to 35 mm long, the lowermost radial spine up to 70 mm long. The radial spines are quite definitely colour banded. In addition I have seedlings of M.itaberabensis, M.nitidus, HU 300 M.oreas, HU 435 M.longispinus, PM 123 M.ernestii, HU 112, and also some M. ernestii from Vandenbroeck's seed. The young HU 112 has much more wool in its areoles than the mature plant and the general appearance is different, but it is difficult to compare young plants of up to 2.5 inch body size with mature plants that carry a cephalium. However, from my own plants I would be inclined to say that M.oreas has shorter, thicker, and almost straight spines, whilst those of the M.ernestii group have longer, thinner, spines with a very long lower spine which is also much curved and bent in all directions, which increases with the age of the plant. Colour banding is not visible on the spines of any of these seedlings.

BRAZIL 81 By G.Heiman, W.van Heek, W.Strecker & R.Paul.
Translated by H.Middleditch from:

K.u.a.S. 34.12.1983

From Seabra we rolled along further in the direction of Itabiraba whilst the topic of conversation naturally did not break off. But some way before we reached that town we turned off the main road and in the tract towards Rui Barbosa we searched for the Melocactus macrodiscus v. minor described by Ritter in his Kakteen in Sudamerika Vol.1 p.133. On smooth rocks we then found only a few examples of a Melocactus which roughly corresponded with the description by Ritter. Whether indeed the appendix "var.minor" was apt, could be called into question, provided indeed that the plants we had found were those of the sort described by Ritter. We were of the opinion from the habit - particularly the spination - that it displayed a great similarity to Melocactus rubrisaetosus HU 137.

In the neighbourhood of Iacu we all searched together for Melocactus longispinus HU 435 of which we were aware that it should occur somewhere thereabouts in the vicinity of the Rio Paraguacu. On the basis of advice received from the inhabitants there, we then found a Melocactus on a flat rocky patch, in the onsetting twilight, which also comes very close to M.rubrisaetosus. There was a great long spined Pilosocereus gounellii as well and also a Zehntnerella. In the gathering dusk and in rain falling with ever increasing heaviness, we drove further on to Milagres and finally into Salvador, the capital of the State of Bahia.

K.u.a.S 5.2.1984

We drove away from Salvador and to the west of Feira de Santana we then found a Melocactus similar to Melocactus rubrisaetosus Buining & Brederoo, which extends over an enormously widespread distribution area. It embraces those plants found by us with only trifling variations, over a huge surface area, as far west as Itabiraba, north up to Senhor de Bomfin, and south to the vicinity of Jequie.

K.u.a.S. 35.7.1984

Travelling south from Villa Fatima, a few km before Feira de Santana, we found Melocactus rubrisaetosus. Then followed a long stretch without cacti. Then about 20 km north of Milagres, west of route 116, we found a great number of Melocactus - as usual on blackish brown, smooth rocks - which are probably allied to Melocactus rubrisaetosus. At Milagres we then turned on to the road to Iacu which we had already travelled along in the opposite direction on the first part of our trip. After no great length of driving, only by a lucky chance did we find to the south of the road, on smooth gently sloping rocks, Melocactus longispinus Buining & Brederoo together with certain transition forms to Melocactus ernestii Vaupel. They were splendid long-spined specimens whose cephalia grew typically with a slightly oblique margin. The habitat location had so impressed us that only after a very thorough survey did we retrace our steps to the main road.

Again we then went south along a good highway towards Jequie. After a night's rest and breakfast there, we arrived quite soon at several habitat locations for Melocactus ernestii. We could not satisfy ourselves over these large plants with magnificent long spines. They grew so abundantly here that they almost formed a carpet. Even the allusions from the children about poisonous snakes being there could not stop us exploring these habitat locations thoroughly and photographing them. Now and again we almost believed that we had Melocactus longispinus or Melocactus azulensis Buining & Brederoo in front of us.

.....from F.Vandenbroeck

It is not at all clear to me what Heiman, v.Heek, Strecker and Paul mean when they say that they found M.rubrisaetosus over such a large area. In my view only forms of M.bahiensis and M.zehntneri may be found to this extent in this vast area.

...from H.Middleditch

The review of Melocactus by Taylor in the GB Journal 42,3:1980 submerged M.ernestii in M.oreas. But in the

subsequent review in Bradleya 9/1991 it is observed by Taylor that "the distribution ... of M.oreas and M.ernestii ... overlap extensively. In two mixed populations observed by the writer in 1991 there was no evidence of hybridisation or intergrading between these two, and despite the practical difficulties for the inexperienced to distinguish them, the only course seems to be to recognise two species." This review is based on extensive field work. but it uses complicated and confusing nomenclature. Here M.oreas is placed in the basin of the lower stretch of the R.Paraguassu which reaches the sea at the town of Bahia. This town was the main port of entry to north-eastern Brazil in Lemaire's time and its hinterland was the probable source of the original M.oreas. Thus the distribution area for M.oreas according to Taylor [1991] probably encompasses the likely source of the original M.oreas Lemaire.

From the numerous slides which we were shown at the 1989 Chileans' Weekend it was quite evident that the Melocacti which grow on one patch of rock are not necessarily all alike as peas in a pod. This situation is interpreted in different ways by different observers. We have from Ritter "In the east of Brazil several species of Melocactus often grow together", whilst we hear from F.Vandenbroeck "Different species of Melocactus rarely grow together in the same population". From Buining (US C & S J XLVI 1974) "in studying Melocactus it was often very difficult to keep apart various species as they grew in and with numerous other species".

.....from N.Taylor, Bradleya 9/91

In eastern Brazil it is possible to find two or more species either growing together in the same habitat or, more often, coming into contact between two ecologically distinct formations. In many such instances the writer has found evidence of hybridisation, and extensive hybrid swarms were encountered on numerous occasions.

.....from J.Hovens, Melocactus neomontanus, Succulenta 64.10.85

In 1981 we found ourselves at a Melocactus habitat site near Brumado, where two Melocacti grew at the self-same spot, namely M.canescens and a Melocactus sp., without showing any signs of transitions or hybrids. The reason probably is that the plants of both sorts are totally self-fertile and on that account capable of replicating themselves. The self-fertile behaviour of various cacti has fascinated me for the last ten years and I have experimented into this a great deal. My conclusion is that many Melocactus spp. cannot be crossed and have a preference for their own pollen.

In addition, in large nurseries on Tenerife where everything is very intensively cross-pollinated, many Melocactus species seem to grow without any noticeable range of variation. Genetic variability seems, therefore, not always to be dependant upon spatial separation. This is quite different with the cross-pollinating sorts such as, for example, M.deinacanthus, M.ernestii, and M.longispinus. In the same period we visited three habitat locations of M.ernestii and we established that the marked differences in habit were much greater than with the self-pollinating sorts.

This situation begs the question, how great the differences between two taxa must be to warrant separate descriptions. Should the self-pollinators have the same criteria as applied to cross-pollinators?

.....from W.Strecker, K.u.a.S. 34.3.1983

In Urandi we left the main road and took a wearying side track in the direction of Caetite. About 10 km further on, Melocactus caetitensis grew at either side of the road, together with another, but closely related, species of Melocactus. We were particularly impressed with a location quite close to the road, where hundreds of Melocactus grew on smooth dark grey rocks. Here was displayed especially well, the degree of variation that is to be met with at many habitat locations; or perhaps one should preferably say, that various species or natural hybrids grew here in harmony side by side? Which are we able to say with certainty? We are of the opinion that certain interesting places can easily lead to different perceptions.

.....from H.Middleditch

Perhaps it is in the eye of the beholder that the decision is made between natural variation of a species and the existence of hybrids, transitional forms, varieties, or more than one species growing side by side. Thus the M.itaberabarensis being grown by D.Angus might well have been regarded as one species by Buining and another species by Ritter. Even one of these plants growing in the field might well be given one name by Ritter and another name by Buining. This could be attributed to the considerable variation within a population, mentioned by most of the above authors, which makes it difficult to draw a hard and fast dividing line between one species and another closely related to it. It is probably the extent of this variation which affords scope for different authors to classify field material in different ways. The extent of this variation also makes it difficult to attribute a plant in cultivation one or other of the species reviewed above. This difficulty is compounded by the apparent lack of explanation as to how Buining considered it so easy to distinguish M.oreas from ernestii (C.& S.Jnl. U.S. 1974) And what are the precise features which lead Eerkens to say that "Melocactus oreas is very readily distinguished from M.ernestii" (Succulenta 63.10.1984)?

The descriptions by Buining & Brederoo of the Melocactus spp reproduced above were accompanied by sketches of spines, flower, fruit, and seed. However, these sketches do not appear to have been drawn to a common scale. In consequence a comparison of the spines as sketched could be misleading. The spine sketches (above) have therefore been redrawn so that the length of the lowermost radial spine approximates to the maximum length quoted in the relevant description. As such, they should be strictly comparable. However, from the above descriptions it will be evident that there is considerable overlap in the lowermost radial spine lengths from one species to another. Other than a M.ernestii with the longest lowermost radial spines, it appears to be open to question whether a set of characters can be specified which segregate any one of the above species from the others. In this situation a geographical segregation offers some possibility of separating designated species.

Eerkens tells us that HU 137 came into commerce under the provisional name of M.itabirabensis, so perhaps this is the origin of the puzzle plant grown by D.Angus. Buining gives HU 137 as the type of M.rubrisaetosus, but locates it from Milagres, not from Itaberaba. This anomaly detracts from suggesting M.rubrisaetosus as a name for the plant grown by D.Angus. If the complications involved in giving preference to a Ritter or Buining name are to be avoided, an earlier name may be preferable. Here it may be noted that Taylor places M.rubrisaetosus into synonymy with M.oreas [Bradleya 9/1991]. If we wish to accept that M.itabirabensis very probably did come from the vicinity of Itaberaba, then it would almost certainly fall into M.oreas rather than into M.ernestii. The spine length of D. Angus's plant would also fall within that quoted by Taylor [Ibid]. Could we suggest the name M.oreas to D.Angus for his plant of M.itaberabarensis?

.....postscript from D.Angus

After promising myself for several years to clean the glass on my greenhouse, the job was finally attended to. It was the worst thing that I could have done, as many of my plants are now getting too much sunlight. Quite apart from the usual loss of turgidity and green colour towards the end of a sunny day displayed by my Melocacti, one or two even got scorched. So now I have had to put up some bubble polythene to try and diffuse the sunlight. On my new greenhouse I am planning to use twinwall perspex sheet for the roof as this will give me both light diffusion and good insulation in the winter.

GERMINATION - A BROWN STUDY, OR A SINKING FEELING? From F.Fuschillo.

Over the last twenty years or so I must have looked through the camera lens at not just a few hundred but more likely at a few thousand cactus seeds. Gymnocalycium seeds of the muscosemineae group like mihanovichii, damsii, and so on, are very consistent in size, shape, and colour. On the other hand many other Argentinian cacti have seeds which can and do vary from black to brown. Even my own plants of Gymnocalycium quehlianum produce seed which can be dark brown one year and light brown the next. One year the hilum has little protrusion and the next year the hilum has a strophiole-like pale brown puffy protrusion.

When I started to obtain seed from J.Piltz in order to photograph it, I found that there were both black and brown seeds in the same packet. At first I was suspicious that some inadvertant confusion had occurred between collecting and packaging the seed, despite assurances to the contrary from J.Piltz. As I continued to persevere in my enquiries to J.Piltz on this point, he eventually sent me a fruit off a Gymnocalycium which contained both black and brown seeds.

I have discussed this problem of variation in seed colour with many collectors in this country and overseas. The general feeling in Europe is that the lighter coloured seed is formed that way because of unripe ovules at the time of pollination and this seems to be the best theory that has been put forward to date.

.....from H.Middleditch

We are told by F.Fuschillo that among certain species of Gymnocalycium seeds which he has studied, there are some of a brown colour and some black, and this apparently occurs not just on one plant but even in one fruit. Is this due to a difference in the micro-wrinkles of the cuticle, or simply a difference in the patchy membranous layers which are already known to occur erratically over the surface of the seed testa?

.....from F.Fuschillo

At this very time I have before me a fruit off my own G. glaucum, (set by crossing with G.ferrari) which I have cut in half and it is quite possible to see both black and brown seeds set in the fleshy internal filling. I will send it to you so that you can see for yourself.

.....from G.J.Swales

The half fruit off G. glaucum which came from F.Fuschillo did indeed have both black and brown seeds exposed on the surface. But when I applied but slight pressure to one of the brown seeds it immediately collapsed without resistance so I must assume that it was not a viable seed. Cutting through a viable seed is quite different as I have had to do this on several occasions when putting them in the electron microscope. This is probably the cause of the brown seeds mixed in with the black, in other Gymnocalycium.

.....from F.Fuschillo

A seed has to be cut correctly in order to get the tops all at the same level for photographing them, but it is very difficult to see just where you are making a cut on something a small as a cactus seed. Sometimes several attempts have to be made in order to obtain a seed that is cut correctly, so that I have had to cut in half many more seeds than I have photographed. All told I must have cut in half many hundreds of seeds. In spite of many seeds being of good ripe colour, when cut in half they have been quite hollow and without any embryo. On the other hand, some packets have contained seed in a range of colours from black to brown and whichever colour of seed I cut into there has been an embryo.

.....from A.W.Craig

We removed over a dozen seeds from the half fruit of G.glaucum which came from F.Fuschillo, some of them brown and some of them black. These were put into a glass of water and stirred round half a dozen times over a period of quarter of an hour or so, when some of the seed sank, and some floated, not all the one colour. After leaving them to stand for about an hour, all the black seed had sunk and all the brown seed was floating. If I have any seed which I suspect is not viable, I would apply this treatment and if it sinks it is worth sowing, but if it floats it is not viable. It was surprising how long it took for this Gymnocalycium seed to decide what to do, in comparison with how quickly it has occurred when I have checked other sorts of seed.

.....from R.Ferryman

At the 1988 Chileans Weekend the float and sink test for establishing viability of seed was mentioned. This idea had been mentioned previously - I believe that it was in the book on Fine Flowering Epiphyllums by McQuown. Early in the following year I found that I had a goodly amount of seed of Neochilenia floccosus on hand - possibly a couple of thousand seeds, so I decided to try the whole of this with the float and sink test. There was no doubt that these seeds separated themselves into a great many that sank and a large, but lesser number, which floated. The floats and the sinks were then sown separately, but under exactly the same conditions. There was indeed good germination of the sinks, but bearing in mind that the amount of floats was less, their germination was surprisingly good, but not as good as the sinks.

.....from C.Holland

Having tried growing Tephrocacti from seed for several years, I find that germination is very erratic, irrespective of whether the seeds are given a pretreatment - chipping, soaking, freeze-thawing, or enzyme soak. With Tephrocactus sensu Kiesling germination is usually 1 - 5%. With Maihueniopsis sensu Kiesling, again germination is only 1 - 5%, but where the seed is fresh, germination can be very good. I have achieved 30% germination with T.glomerata DJF 176 and I believe several members also had good germination with the P & W seed. Despite sowing several hundred seeds of the sphaericus-kuehnrichianus sort, again subject to the various pretreatments mentioned above, no success at all has been achieved so far. Of the Austrocylindropuntia floccosa/lagopus sorts, obtained from KK in varying quantities (one thousand in the case of rauhii), so far I have only one seedling of floccosa v.crassior KK 765. Of the Austrocylindropuntia of shaferi-weingartiana affinities, germination has again been only 1 - 5% irrespective of pretreatment. With Cumulopuntia sensu Ritter germination has been very low and very erratic. Seeds have been obtained from e.g. Kohres, Rowland, Brack and KK, of many species, in quantities of up to a thousand in some cases. The only successes to date are one ferocior, one cylindriarticulatus, one Sp. Tastil and one ovallei KK 1843.

.....from R.K.Hughes

Could this problem be related to what I have found with Austrocylindropuntia seed? Externally the seed may look perfectly formed, but in removing half of the hard seed coat prior to sowing, many of the seeds had a dried-up or non-existent kernel. In the case of A.weingartiana I have two plants from 100 seeds, or perhaps it was two plants from far fewer than 100 viable seeds? The same sort of thing was found with one or two of the seeds which I received from B.Bates after his trip to Bolivia and also with some of the floccosa group seeds which I collected myself in Peru.

.....from C.Holland

I am interested in this float/sink hypothesis as an indicator of seed viability. However, I would expect that a lot of

smaller-seeded sorts would float regardless. When I have soaked Tephrocactus (and similar Opuntioidea) seeds in the past, I have noticed instances where a few have floated and most sunk, or visa versa. Unfortunately the highly erratic success rate achieved in germinating these subsequently, makes it difficult to draw any conclusions. Those species of Tephrocactus sensu Kiesling, with their arils full of air spaces, tend to float anyway. The arils of these types are very easy to chip away, but even so I have found that what look like perfectly formed seeds inside still do not germinate. I suspect that where R.K.Hughes has found a dried up pip under the aril is where the embryo has failed to develop or similar, as opposed to a good seed losing viability and drying up. Bearing in mind the level of dehydration of the contents of a seed, I wonder if there is much scope left for further shrinkage. Having said that, when pricking open the testa of Maihuenia seeds I often find that the contents appear to have shrunken away significantly from the inner wall of the testa without adversely affecting viability. Conversely I have rarely found any significant shrinkage of Tephrocactus or Austrocylindropuntia seeds when I have tried chipping, but still have not had any significant success except with seeds which I knew to be fresh, or relatively so. However, just to remind myself, I recently sowed some chipped and unchipped seeds of T.viridiflorus (a name I can not find in the literature) from Kohres. These are typical bolivianus group seeds, with arils as tough as iron. I went through about 20 seeds to get ten that would be any good, but in the process did not find any that were just dried up inside.

GYMNOCALYCIUM SPEGAZZINII WO15 By W.Knoll
Translated by H.Middleditch from GOK Journal

The final halt during my first trip through the mountains of northern Argentina was at Cafayate, a small town in the south of Salta province. Around the town lie extensive vinyards, in which ripens some of the finest wine I have drunk. Of interest for the cactophile however are the many sorts of cacti that one may come across in the surroundings.

On a glorious November morning I set out, with my rucksack on my back and pickaxe in hand, past the cemetery and out of the town and straight to the first hill, to have a little look round there. At the foot of the mountains some magnificent specimens of Gymnocalycium saglionis with a diameter of 45 cm greeted me straight away. Then some metres further up stood some superb plants of Parodia, often in the close vicinity of immense cushions of Hechtias, which cover extensive patches of the cliffs here.

Some particularly fine specimens of both sorts found their way into my rucksack, whilst I climbed up even further still, passing the giants among the argentinian cacti, Trichocereus pasacana. At half way up, a few plants of Parodia penicillata surprised me by growing there, in some crevices in the rocks almost without earth and the fine dense golden spines invited me to take them along.

The day slipped by with keen collecting and by early afternoon I started on the downward climb. When I had got as far as the last slope before the town, all of a sudden a slab of stone gave way beneath me and I slid for about 15 m down a long scree slope of gravel. On reaching the bottom I clapped the dust off my clothes, found to my great delight that I had not hurt myself, and was already about to get on my way again when my gaze fell upon a bush - or, more accurately - upon what was under the bush. I had found the first specimen of Gymnocalycium spegazzinii.

The flat body with the thick turnip-like root with only its top surface projecting out of the fine sand, the few short spines lay close to the grey-brown body. From specimens which I found close by, I was able to establish that the body colour varied; they ranged from pale grey through green in all shades up to brown and also violet. Also variable is the colour and length as well as the number of the spines, but these have their basis in the differences of microclimatic conditions.

As it is problematic whether to establish new varieties or even species upon the basis of such differences, judgement needs to allow for the unbelievable variability of certain species which has been seen in habitat. In regard to G.spegazzinii, I was able to observe again and again: there stood two examples only a few metres from one another and yet looking so different, since the first specimen grows under a bush and the large, dark green body bears only a few, short, whitish spines, whilst the other one stands exposed to the full glare of the sun and hence remains smaller, the epidermis is violet-red coloured and developes more spines and these are much larger and of a darker hue.

Some months later I found the selfsame species once again, but further to the north in the vicinity of Cachi, where it grew much larger and is more strongly spined; and for the third time I was able to collect G.spegazzinii in the Quebrada del Toro, from where my finest and most densely spined plants originated. It is understandable, when one takes into account that this species grows at an altitude of 3000 m, that the harsh climate surely requires this spine formation there.

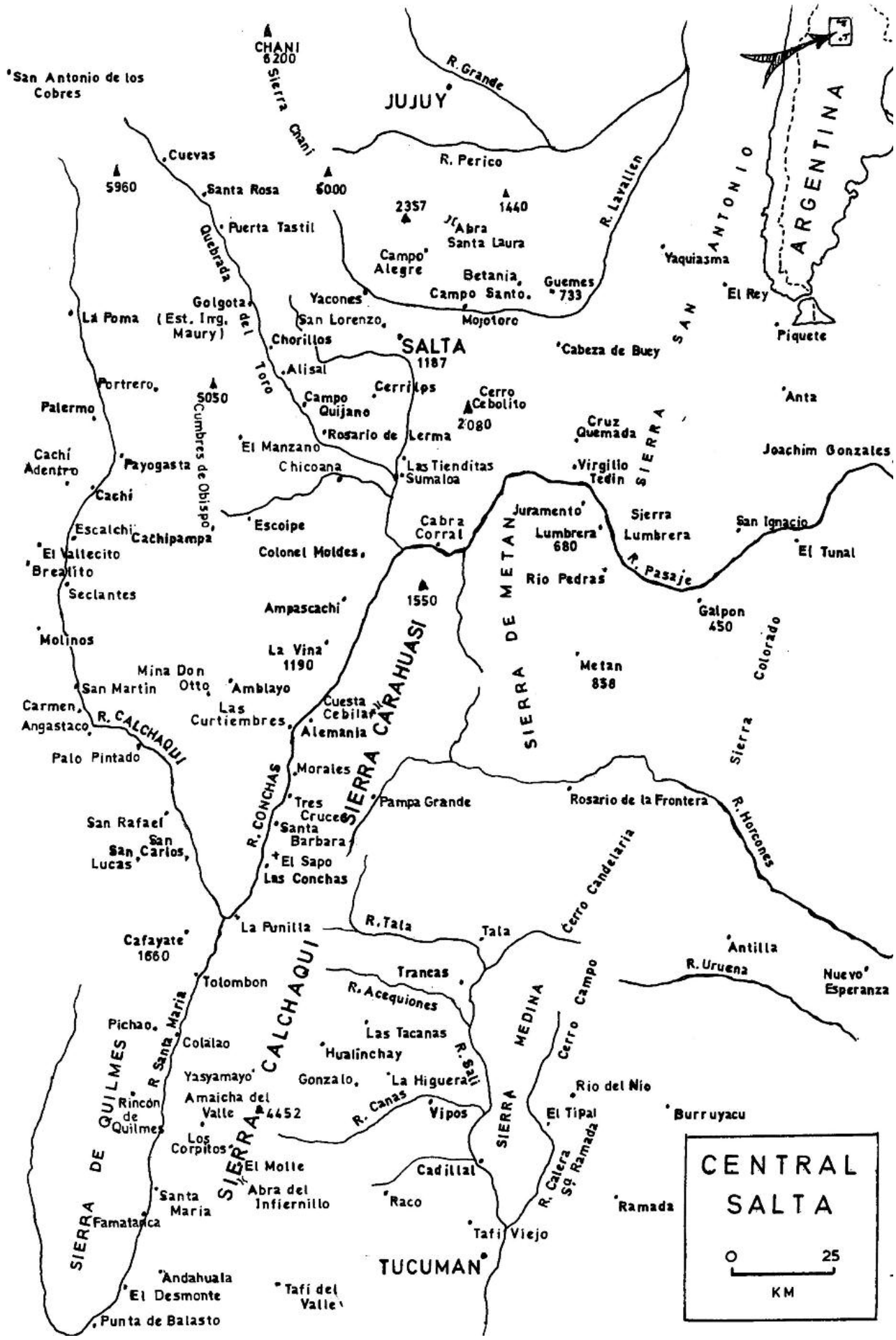
As to the cultivation of this species, I can observe as follows: in its habitat the plant is found in fine sand, gravel, and scree, where because of the almost complete absence of accompanying flora, no humus is to be seen. As a compost, sandy earth with abundant mineral constituents is therefore suitable. As to watering, one should be rather careful; if it is treated to complete dryness in winter it will certainly not come to harm from a brief mild frosty night.

.....from J.Lambert

It was in the course of my visit to Argentina in 1981 that I first came across G.spegazzinii in habitat. This was when travelling north along the valley of the Rio Santa Maria. Just before reaching Colalao we stopped at El Hombre Muerto where this species was found more or less sheltered by the surrounding bushes and always surrounded by numerous stones. It was at Cachi where we met the second population of this species, where our attention was caught by a superb cristate specimen. When it was dug up, it was discovered that it was only part of one and the same plant with the normal heads surrounding it, as the tap root extended into a kind of subterranean plate with several heads! Most of the plants of G.spegazzinii which I have seen in habitat were indeed growing flush with the ground. I once observed many of them near Amaicha del Valle growing in this way, also near Pichao, as well as near Seclantes. This is why the plant was given the synonymous name of “G.horizonthalonum”. In cultivation, plants generally grow more upright.

.....from R.Schultz

Our 1994 trip took us through San Antonio de Los Cobres and from there, along the Quebrada del Toro. We saw plenty of Gymnocalycium spegazzinii here from nearly 3200m down to 1500m. It was just before we saw the first Trichocereus pasacana that we met with the first G.spegazzinii. Here they grew together with Eriosyce umadeave, but the Gymnos grew on rocks whilst the Eriosyce grew on alluvial material. Here the Gymnos grew above ground level; they had the most attractive spination and were the least variable. Lower down the Quebrada Toro we saw many G.spegazzinii level with the surface of the ground, where they were growing in alluvial mud and stones.


CHANI 6200
Sierra Chani
San Antonio de los Cobres
JUJUY
R. Grande
R. Perico
R. Lavallen
ARGENTINA
SAN ANTONIO
Cuevas
5960
Santa Rosa
6000
2357
1440
Abra Santa Laura
Puerta Tastil
Quebrada del Toro
Campo Alegre
Yaquiasma
Betania
Campo Santo.
Guemes 733
El Rey
Golgota (Est. Ferr. Maury)
Yacones
San Lorenzo
Mojotoro
La Poma
Chorillos
SALTA 1187
Cabeza de Buey
Piquete
Alisal
Portrero
5050
Cumbres de Obispo
Campo Quijano
Cerrillos
Cerro Cebolito 2080
Anta
Palermo
Rosario de Lerma
Cruz Quemada
SIERRA
El Manzano
Joachim Gonzales
Cachi Adentro
Payogasta
Chicoana
Las Tienditas
Sumaloa
Virgilio Tedin
Cachi
Escalchi
Escoipe
Cachipampa
Cabra Corral
Juramento
Sierra Lumbrera
San Ignacio
Lumbrera 680
El Valletcito
Colonel Moldes
El Tunal
Brealito
Rio Pedras
R. Pasaje
Seclantes
1550
Ampascachi
Galpon 450
SIERRA DE METAN
Molinos
La Vina 1190
Colorado
Mina Don Otto
Metan 858
San Martin
Amblayo
Carmen
Cuesta Cebilar
Las Curtiembres
Alemania
SIERRA CARAHUASI
Angastaco
R. CALCHAQUI
Palo Pintado
Morales
Sierra
R. CONCHAS
Tres Cruces
Pampa Grande
Rosario de la Frontera
R. Horcones
San Rafael
Santa Barbara
San Carlos
Lucas
El Sapo
Las Conchas
Cerro Candelaria
La Punilla
R. Tala
Tala
Cafayate 1660
Antilla
Trancas
R. Uruena
Nuevo Esperanza
Tolombon
R. Acequiones
Pichao
Las Tacanas
Hualinchay
R. Santa Maria
Colalao
SIERRA MEDINA
Cerro Campo
SIERRA DE QUILMES
Yasyamayo
Gonzalo
La Higuera
Rio del Nio
Amaicha del Valle 4452
R. Canas
Vipos
El Tipal
Burruyacu
Rincon de Quilmes
Los Corpitos
SIERRA CALCHAQUI
El Molle
Cadillal
R. Calera Sq. Ramada
Abra del Infiernillo
Raco
Ramada
Santa Maria
Famatanca
Tafi Viejo
TUCUMAN
Andahuala
El Desmonte
Tafi del Valle
Punta de Balasto
CENTRAL SALTA
0 25
KM

THE VARIABILITY AND DISTRIBUTION OF GYMNOCALYCIUM SPEGAZZINII By J.Piltz
Translated by H.Middleditch from K.u.a.S. 28.9.1977

In 1964 Frank had already reported upon the variability of this species and endeavoured to provide a detailed description of it, dealing fairly accurately with the body sizes and rib counts of the range of forms at the various habitat locations. At the same time he plotted the occurrence in the near and far surroundings of the city of Salta and gave as the habitat area from Cachi in the north and an isolated location 200 km southwards at the village of Amblayo.

Here, however, some inaccuracies had crept in. To start with the distance between Cachi and Amblayo does not amount to 200 km but 40 km as the crow flies and precisely 96 km by road. The extra distance by road arises from the need to travel first to the east to the Cachipampa and then some km beyond the junction with the road to Tintin, turning off right in a southward direction. From here a pretty wretched earth road runs to Amblayo. In addition, I cannot imagine it to be right that G.spegazzinii grows in the "near vicinity" of the city of Salta. Of course when considering distances in Argentina the expression "near" is naturally very elastic. The city of Salta lies at an altitude of 1190 m at the foot of one of the north-to-south running ranges of the eastern Andes, on whose eastern slopes, on account of the the moist air mainly coming from the north-east, there grows a rain forest which becomes ever more impoverished from north to south. Crossing the eastern mountain range and leaving behind the 3000 m cloud ceiling, one descends into an area influenced by quite a different climate. The sky is bright blue for almost the whole year, with only a few rainy days and nightly dew accounting for the precipitation. We have now observed that G.spegazzinii favours these drier areas, since all of the habitat locations found by ourselves and also those mentioned by Backeberg, Rausch, Lau, and Rawe, lie in the more elevated arid regions.

The northwestern forms may come from the Quebrada del Toro. Rawe illustrates a very densely spined specimen, also the plants found by Lau, L.530, display a sturdy spination. We found G.spegazzinii in the north of its area of distribution between Payogasta and La Poma on the campos of the Valle Calchaquies at 2400 m. The plants which we saw there, usually had a greyish-brown epidermis, with the grey spines lying fairly close to the body. An extreme specimen displayed ribs divided into tubercles with unusually straight projecting spines. If one turns away from the Calchaquie valley towards the north-east in the direction of Portrero, a similar population of G.spegazzinii is to be found in the company of a Parodia of the Microsperma group, P.65 and at a somewhat higher altitude Parodia aureicentra P.66 together with a very fine Acanthocalycium P.67. Here a bridge may exist via the Quebrada Capilla to the Quebrada del Toro.

Amblayo, as the next further south lying location, appears at first sight, certainly, to be very isolated. The plants there are mainly beset with strong dark spines according to a verbal communication from van Vliet. Even here a connection can exist to the southern part of the habitat area, since the valley of the Rio Amblayo discharges into the valley of the Rio Calchaqui near San Carlos, at about 40 km to the south of Amblayo. From San Carlos a road goes to Punilla, a village in the valley of the Rio de las Conchas and connects up with both river valleys. Along this road a form-rich population of G.spegazzinii is again found. Near La Punilla and somewhat further to the north and south stand plants with a more brownish epidermis and horn-coloured spines in the new growth, later becoming grey. Some examples had 9 radial spines.

The main area of distribution of this species however appears to lie in the valley of the Rio Santa Maria. This valley starts in the north where the Rio Santa Maria and Rio Calchaqui join up to form the Rio de las Conchas, and terminates about 100 km further to the south in the Campo Arenal, a bowl-like plain rising gradually up to 3600 m altitude. The mountain chain which bounds the Campo Arenal in a semi-circle impedes the further southward advance of Gymnocalycium spegazzinii, for on the other side of the mountains, near Andalgala, we no longer met with this Gymnocalycium.

As we have seen the centre of distribution of G.spegazzinii in the valley between Cafayate and Capillitas, the abundance of forms in the habitat locations lying close by can be left to the imagination. Here we find plants with more brownish and more blue-green epidermis, the colour of the spines varies between horn colour and grey to almost black. Between Tolombon and Cafayate at 1600 m exist plants with generally blue-green epidermis, some becoming almost enclosed in stout grey spines whilst others had wider ribs. The areoles are disposed further apart and the usually 5-7 yellowish to grey spines lay almost against the body.

Somewhat further to the south between Tolombon and La Vinita the relationship between plants with brownish and blue-green epidermis again becomes clear. They were partly enveloped in stout spines, others furnished with a more slender spination. Here as well as near Amaicha at 2300 m we generally found the largest specimens. These imposing plants with 33 ribs attained a diameter of more than 30 cm and a height of 20 cm; also near Amaicha were some forms surrounded with stout spines like a rigid wicker basket. These plants correspond to L.541 from Lau, which he found near Amaicha. Beyond Santa Maria and Famatanca, the area of distribution of G.spegazzinii continues to the south. If one turns at the end of the valley beyond Punta de Balasto along Ruta 63 and drives up to the foot of the Nevados de Aconquija towards Capillitas, scattered occurrences of G.spegazzinii are also met with here. We found the southernmost location at 2800 m, some km prior to the Mina Capillitas. Here grew scattered plants together with a fine form of Parodia microsperma, with a white woolly crown and bluish black to violet hooked spines, P.51. Even at this southernmost location, no dominant type of this Gymnocalycium could be recognised. As a crowning conclusion, so to speak, we found a magnificent flat-growing cristate form with brownish epidermis and horn coloured spines.

The distribution of Gymnocalycium spegazzinii thus stretches from the Quebrada del Toro in the north via Cachi, Amblayo, Tolombon, and Santa Maria to a short distance before Capillitas, which amounts to a north-south extent of more than 300 km. Possibly a connection exists between the Quebrada del Toro via Potrero to Cachi, and between the isolated location near Amblayo via San Carlos and La Puntilla to Cafayate in the valley of the Rio Santa Maria.

In this valley we also found the origin of the distribution of Gymnocalycium spegazzinii. At all those habitat locations which we visited, we could find no dominant type, but degrees of variety existed of which the transitions merged into each other. It is worthy of note that apart from the northernmost and southernmost habitat locations, the occurrence of G.spegazzinii is usually concurrent with that of Acanthocalycium. Whether that Gymnocalycium also grows near Hualfin together with Acanthocalycium glaucum has yet to be proved. It is certain that, on the basis of data provided here, that Gymnocalycium spegazzinii not only occurs in Salta province,but also in Tucuman and Catamarca provinces.

.....from J.Lambert

The review of Gymnocalycium by J.Piltz (above) was accompanied by a map showing the locations at which Piltz

had observed G.spegazzinii. Along the length of the Rio Calchaqui there are no locations plotted for the occurrence of this species between San Carlos and Payogasta. However, we did meet with G.spegazzinii in the vicinity of Cachi, at 2500m. We also found this plant at an altitude of 2100m near Punta de Balasto which is where the road to Capillitas turns to the south out of the valley of the Rio Santa Maria. It was also seen at: Pichao, at 2000m on the heights west of Colalao; at Los Zazos and Zurita, respectively 4 and 8 km south-east of Amaicha del Valle, at 1950m and 2100m; and at Chorrillos, Quebrada del Toro, some 35 km to the south-east of Alfarcito at 1950m.

.....from K.Gilmer

In the valley of the Rio Calchaqui we came across G.spegazzinii at three places which are not plotted by J.Piltz on the map published with his article (above), Firstly at a spot near San Martin; then between Seclantes and Escalchi, where we also saw a cristate specimen; and near Lago Brealito, about 10 km into the mountains from the Rio Calchaqui. We also came across this plant near El Obelisco, about 20 km before reaching Cafayate from Salta, as well as just to the south of Cafayate itself.

.....from J.Lambert

Generally speaking, one may say that the distribution of G.spegazzinii as given by Piltz is correct, but it extends a bit more to the west between Cafayate and Cachi.

.....from G.Charles

At the stop we made on the southern outskirts of Cachi, we scrambled up the steep slatey rock close to the road, then came out on a fairly flat top. I remember seeing the G.spegazzinii growing there, plants up to 8" or 9" tall, standing columnar above the ground. Elsewhere in the Quebrada Cafayate it was very dry and the plants were level with the sandy soil.

As we travelled along the Quebrada del Toro the G.spegazzinii do not appear until the slopes have little vegetation other than cacti. It was always apparent that G.spegazzinii liked an arid environment and seemed to thrive out in the open, away from other vegetation. This is in contrast to most other species of Gymnos, which usually grew under shrubs. The only obvious exception to this being G.ferrarii, which comes from much further to the south. Perhaps this is why G.spegazzinii is the only species of Gymno in these northern high altitude locations? We saw it at many places and always the soil was mineral with little non-cactus vegetation. The plants varied a lot in regard to spine length and density, also the degree to which they were shrunken; in the Quebrada de Cafayate, near Las Ventanas, it was very dry and the plants were level with the sandy soil, being little more than patterns in the surface of the ground.

.....from C.R.Pugh

In the course of the trip to Argentina in 1992, we were travelling north towards Salta, when we made a stop not long after we passed through Cafayate. We were not yet into the Quebrada Cafayate, but still in a broad valley with gently rising sides. Here we might have been 200 to 300 yards from the river itself. Along the edge of the river there were some green bushes and trees, whose roots would have access to water, but otherwise all the surroundings were very dry indeed. There were scattered bushes, all leafless, with nothing in the way of grasses. The ground was made up of sand and grit, but I do not recollect seeing any stones on the surface. We left the car and spread out from the vehicle each in a different direction. There were Acanthocalycium in flower which were quite abundant here, giving the impression that they preferred to be near the bushes rather than out in the open, although plants grew in both situations. After walking some distance I found that I was stepping over - and probably on - Gymnocalycium spegazzinii, which were almost level with the surface of the ground and of a dark grey-brown colour, not greatly different from the colour of the surrounding earth. Many of these plants were in a shallow crater, frequently with a gap forming a ring all round them, giving the distinct impression that they had shrunk down into the ground and shrunk in size as well, during the course of the dry season. Later on during our trip, when we were much further to the north of this site, we met with some very heavy rainfall indeed at several places. Should this sort of rainfall also occur here, then once the rainy season really starts these plants may well expand and rise above the surface of the ground. None of the G.spegazzinii here was in flower; when we made another stop here on our return trip south, near the end of November. The Acanthocalyciums were still in flower, but on the G.spegazzinii we only found one bud which was probably just about to open.

Reaching the outskirts of Cachi, we stopped where we were not far from the river, whilst on the other side of the road there was a steep slope of slate-like rock. At first glance the weathered debris on the surface of the rock looked as if it was mud - which of course it was not. Although the gradient was quite steep, it was possible to walk up the slope with care and here we came across a Parodia, possibly P.heteracantha, which even grew on almost vertical patches of rock. Once we reached the top of the slope - barely a five minute scramble - we came to the crown of the hummock which was probably no more than 60 feet wide. On the far side, it dropped down into a gulley, the mountains rising up at the other side. On top of this hummock there were practically no bushes, a few ankle high shrubs and little sign of grasses, plus a few herbs. Here grew Parodia aureicentra (but no P.heteracantha), a Lobivia haematantha v.elongata, an Acanthocalycium, and again G.spegazzinii, this time mainly standing proud of the ground. On the far side of the hummock there were quite a lot of Bromeliads, about a foot high, some of them growing in patches up to a yard across, but not so many as to make it impossible to walk between them. Among these Bromeliads there continued to grow the P.aureicentra, the Lobivia, and the Acanthocalycium. On the short, sharp climb up to the top of this spur of ground we had not seen any Bromeliads. The road here was on the west side of the river and this ridge of ground was running out towards the river, so the steep side next to the road with the P.heteracantha would be facing north or northeast, whilst the opposite side with the Bromeliads would be facing south or southwest. We could see similar spurs of ground at the foot of the mountains on the other side of the river. Further north, beyond Cachi, there were similar spurs but with even steeper fronts facing the river.

To the north of La Poma we made stop on a fairly flattish area which must have extended for a few hundred yards across the valley floor, and at least as far up and down the valley. Here again we met with G.spegazzinii, but now growing in a quite different sort of ground, the surface covered with a great many sharp stones, mostly between fist and head size. Near the river the edge of this flat area broke up into numerous spurs or fingers pointing towards the river, which terminated in a short and fairly sharp drop to the level of the river. From where we were standing, we could see the same sort of fingers or spurs running out from the flat area on the other side of the river, as if they had been pushed out by glacial action. It gave the impression that the sharp stones were not confined to the surface of this flat area, but that there were likely to be many more below the surface, if we had wanted to dig down into this ground. Scattered low bushes, up to about knee-height, were fairly abundant but they were far enough apart so that they did not impede us as we walked round. There were occasional tufts of grass. Once again the Acanthocalycium here were in bud, looking as though they would shortly be in flower, but not the Gymnocalycium, which hardly seemed to be shrunken into the ground here. Again the body colour was a dirty grey-brown and the spines were closely appressed to the plant body.

We did not go much further up the valley before we were obliged to turn round in order to head for Salta, so that this location near La Poma was the highest point at which we saw G.spegazzinii in the Calchaquies valley. Here we would be about 3000m altitude. On this same flat area we also saw a number of hummock forming Tephrocactus, many bearing large fruit. We had not seen any hummock forming Tephrocacti at lower levels in this valley. When climbing up to the Abra del Infiernillo from Amaicha del Valle, we again saw together the last G.spegazzinii on this climb and the first hummocks of Tephrocactus, once more at about this same altitude of around 3000m. At none of these places did I get the impression that the G.spegazzinii were growing at a spot where local flash floods had deposited the seed which then germinated and grew there.

.....from K.Preston-Mafham

In the Quebrada del Toro the lower part of the valley is the really wet section. Here the Cleistocactus grow on the rocks, just like the Rebutia, where they get their moisture from the rainfall and presumably from moisture seepage via the bedding planes in the rock during the dry season. But further up the valley, before reaching Chorrillos, the Cleistocacti have moved off the rock faces on to the slopes and it was when this change had taken place that we first came across G.spegazzinii.

.....from R.Ferryman

The lasting memory of Gymnocalycium spegazzinii is of a very tough bodied plant - perhaps Gymnocalycium dura would have suited it as an ideal name. Plants the size of small dinner plates were so tough that you could stand on them without fear of damage to either you or the plant. It grows in some very barren areas and the mode or speed of growth is linked to its habitat. We found it growing in pure quartz sand where it was drawn into the ground and the ribs were very close together. The sunken crown was often covered in sand and where the plant was more or less level with the ground, the sunken crown appeared to be larger pro rata than on plants exhibiting good growth above ground level. Similarly when the plant was in better growing media it was more open but never lush.

Spination varied appreciably, even in an individual population. Some plants can be superbly spined - they would be virtually covered with typical short, strong, curved spines. Young plants in particular showed quite short, comb-like spination wrapping against the body and this feature was evident even in more mature plants, where the spination was short enough to expose the ribs and body. The variation in spination I put down simply to local micro climates. But there was less variation in spination in those flat areas where the ground as we saw it was fairly uniformly composed of fine quartz crystals. There was also quite a variation in the amount of wool in the crown. On some plants there was very little wool in the crown whereas on others the top of the plant was so woolly that it almost looked like a cephalium. Stooping down to take a close look at the odd plant or two sunk level with the ground, it was natural to blow away the fine sand filling the sunken crown, in order to be able to get a good look at it. In this way the wool was exposed on a relatively small number of the many plants growing more or less level with the ground on a flat, sandy area, but the assumption is that the woolly crown would be present on them all, It was also noticeable that these plants flush with the surface of the ground were not very spiny, having shortish spines and so lacked the protection provided on the more spiny plants. The sand on the crown I do believe would provide some protection to the growing point. If this was removed - by, for example, a heavy downpour, then the wool would remain to protect the growing point from the sun.

We travelled through the valley of the Rio Santa Maria which is a very broad valley with the mountain tops lying at a considerable distance at either side - probably several miles away. The sides of this valley adopt a relatively moderate slope, rising from the wide valley floor which is broad and flat in places, more undulating in others. From the road running along the floor of this valley we turned off, taking the road leading to Amaicha del Valle, now following the valley of the R.Amaicha. Again this was a relatively wide valley, broad and flat in some places and rather more undulating at others. We stopped above Amaicha shortly after we reached the first stands of columnar Trichocereus, where the ground was fairly undulating, as there was always the chance of finding different plants on the slopes and on the crowns of the hills. Here we found G.spegazzinii, which was localised on the more level patches of ground, where it was easy to set up the camera tripod. It grew in ground formed largely of broken rock with an admixture of real soil, in the company of a little grass together with occasional herbs and low shrubs. Here and there some solid rock outcrops were exposed.

Quite near to where we found G.spegazzinii there grew a white-spined Platyopuntia sp., whilst the columnar Trichocereus pasacana grew scattered around on all sides, The Parodias seemed to prefer the sides of small ravines. growing on the cliffs or steep slopes. Higher up the climb towards the Abra del Infiernillo we made another stop and again found G.spegazzinii growing in similar circumstances. At both places we met with plants growing flush with the ground as well as others in the form of a hump, to almost hemispherical shape. At a third stop, not long before the pass itself, we no longer met with any G. spegazzinii.

From here we went further north, to Cafayate. After we left Cafayate and before we entered the Quebrada Cafayate we stopped where the ground stretched for a considerable distance away from the road not quite level, but slightly undulating. There was only a scattering of bushes and trees. the ground between them being largely bare of vegetation. Here we came across G.spegazzinii either flush with the ground or slightly humped above the surface of the ground. Intermingled with the sandy grit making up most of the surface here were also numerous fossils, such as sea shells and so forth. Near Las Ventanas in the Quebrada Cafayate the steep hills forming the valley sides were fairly close to the road so that there were only small patches of ground like that at our previous stop. Here the G.spegazzinii were again similar to those at our previous stop. At neither of these places were there any columnar Trichocereus to be seen.

After travelling quite a few miles through the narrow parts of the Quebrada Cafayate the exposed rocky outcrops began to give way to hill slopes. In addition a terrace or bench had formed alongside the river; the road along which we were travelling ran on this bench. Where we stopped a few km south of Alemania the terrace was almost continuous alongside the river. This was one of the hottest places at which we stopped in the Andean valleys. This heat was not due to the time of day, but probably because the valley was still relatively narrow and this confined the heat. It was rather unusual to see here both dusty patches of ground with precious little vegetation as well as patches of greenery that might almost be described as luxuriant. The bank of the terrace rose fairly steeply at the side of the river and was completely devoid of vegetation. The terrace merged quite abruptly into the hill slopes. Both the dusty patches of ground and the greenery occupied the more level ground of the terrace but only the greenery extended up the slopes. Here we found G.spegazzinii growing on the terrace as well as on the adjacent slopes, not in the almost bare dusty patches but with the scattered low-growing bushes which occurred between the dusty patches and the real greenery. Most of these plants were humped a few cm above the surface of the ground whilst only a few grew flush with the ground surface, and then only close to the vegetationless patches.

Two visits were made to the Quebrada del Toro, about ten days apart. On the first occasion several stops were made

and the members of the party spread out in various directions in search of cacti. Here we found G.spegazzinii in the drier middle reaches of the valley, not in the damper lower section. In this lower section there were Cleistocactus to be seen and they were still in the vicinity when we came across the first G.spegazzinii. The Quebrada del Toro was almost the direst environment of all the places where we saw G.spegazzinii, and yet they were the most picturesque plants. The plants were mostly standing above ground level, plump and almost globular. Very few plants were seen drawn well down into the ground, probably because the ground was obviously fairly rocky. In places there were even outcrops of solid rock. In consequence, few if any of the plants seen here displayed a mat of wool in the crown. However it ought to be said that this woolly crown may well have occurred on the lower growing plants with a depressed crown, but very few of these were examined here for this particular feature. A fair number of fine "seedling" plants were seen, on the flats as well as on the slopes.

On the second visit to the Quebrada del Toro we walked away from the road up the side of the valley, for about an hour, most of the time following a track which wound steadily up the hillside. In all probability this track had been used as a mule trail for decades or even centuries. Plants were seen mostly on gently sloping or level patches, seldom if ever at steeper places. There were even G.spegazzinii to be seen on the mule track itself, but these were of rather lower growth, compared with others away from the track. On a fairly flat patch, but rather rocky, there was probably the largest G.spegazzinii we saw in Argentina. It was some 200mm in diameter and 120 mm high [8" by 5"]. The plants here displayed the greatest variation in spination of any of the places where we found them, not just in the length and width of the spines but also in the degree of fan-like spread from the areole and the extent to which they stood away from the body. This was probably because more of them stood further above the ground here and in consequence the variation in spination caught the eye more readily. In addition we spent more time all told in the Quebrada del Toro than at any other single site so we saw more examples of G.spegazzinii here. However, even if we had spent more time at the other sites and so found more plants there, I do believe that we would still not have seen as wide a variation as we saw in the Quebrada del Toro.

At some of the spots where we found G.spegazzinii growing here there was little in the way of accompanying vegetation whilst at others there were well scattered low growing bushes, about knee high. Here and there both on the flats and up on the slopes we also found Platyopuntia and Airampo growing in the vicinity of G.spegazzinii. At a few places we came across G.spegazzinii where Trichocereus were growing nearby, but on terrain of a slightly different nature. Where we met with the hummock forming T.bolivianus, it appeared to occupy different ground to G.spegazzinii.

Travelling north from Cachi we were following what had become a somewhat narrower river valley, but immediately to the north of La Poma we came to an unexpectedly wide and almost level section of the valley. It was a good two miles wide and extended possibly four or five miles north to south, narrowing upstream. We stopped to examine this ground where the bushes would be roughly a stone's throw apart and about one metre high - when you bent forward to look closely at the ground, the top of the bush was about level with one's back. There was no grass to be seen. The ground was made up of fine quartz and the G.spegazzinii were mostly level with the surface of the ground.

Those plants of G.spegazzinii which grew level with the surface of the ground, or appeared to have shrunk down into the ground, certainly attracted my close attention as it was remarkable how they had managed to adapt themselves for survival in such adverse circumstances. They reminded me very much of the Thelocephala that I had seen in Chile, likewise shrunken right down into the ground and partially covered with sand and grit. At the same time I was struck by the variety of the surroundings in which G.spegazzinii existed. With Acanthocalycium, for example, it was quite possible to look at a spot and say "we will find Acanthocalycium here". But nowhere was it possible to look around and say "we will find G.spegazzinii here" - it grew in so many varied circumstances.

.....from F.Vandenbroeck

As to G.spegazzinii, this is certainly a very interesting plant. As far as I can remember, it is the Gymnocalycium species which, perhaps together with G.cardenasianum to which it shows much affinity, grows in the most harsh conditions. This species was observed in the Quebrada del Toro, near Puerta Tastil, in the Valles Calchaquies as far north as La Poma,and in the Valle Santa Maria, especially around Quilmes.

As far as I could observe, younger plants tend to keep their flat bodies deep in the soil, only older plants develop globular bodies. Very old plants may even tend to grow slightly columnar. These old specimens often possess such an armour of spines that the plant body is no longer visible.

.....from B.Schweitzer

At BKS 20, just south of San Martin and at BKS 21, just south of San Jose de Escalchi, we found G.spegazzinii. Many of these plants were growing columnar, although they were not only growing in this manner, but the columnar growing plants outnumbered those flush with the ground.

TRAVELLING THROUGH ARGENTINA By B.Schweitzer
Translated by H.Middleditch from Gymnos 10 (20) 1993.

After our arrival in Cordoba we negotiated a tariff for the hire of a vehicle for three weeks and purchased the newest maps from the Argentine Automobile Club. Then we set off to the north towards Aqua d'Oro where our Gymno friend F.Strigl owned a house and some land. [The route went to Dean Fumes, with exploration at various places in the Sierra Cordoba, then to Monteros, prov. Tucuman and on to Tafi del Valle.] We left Tafi del Valle and at 2600m came out above the clouds in a temperature of almost 30°C, a change that had not previously been experienced. The route took us through pasture-like grass covered slopes up to a height of 3045 m at the Infiernillo pass. A greater contrast can scarcely be envisaged in both climate and vegetation in a stretch of about 30 km as the transition from moist rain forest to the warm high steppe. Already we came across fine specimens of Soehrensia bruchii, a hummock forming species of Tephrocactus and magnificent Acanthocalycium variiflorum.

For me it was of particular interest to find whereabouts G.spegazzinii would appear for the first time. It was already known to us that it occurred in the vicinity of Amaicha del Valle, from the discoveries of J.Piltz. We could scarcely believe our good fortune when we came across the first plants of G.spegazzinii quite some distance before the habitat location of Piltz P43b and at a decidedly higher altitude. The splendidly spined specimens stood here among rounded pebbles, partly in damp sand of the alluvia deposited by the streams and rivers descending from the mountains. All the specimens growing level with the ground gave the impression that at a certain time of year they were covered with flood water. Significantly they often grow in association with a crook in a branch or root at the base of a bush or in the corner of a rock or a pair of stones, as if either the seed or the already germinated seedling had come to a halt there when being

carried along by the flood. At the precise habitat location of P.43b we still found two areas very well peppered with G.spegazzinii. The altitude quoted by J.Piltz for P.43b must be rather too high at 2300m, since at the distance from Amaicha del Valle which he quotes, the altitude amounts to no more than 2100m.

After an overnight stop in Cafayate, we knew from the many accounts of our Gymno friends who had made several trips to Argentina that we would expect to see a breathtaking landscape, namely the Quebrada de Calchaqui. We can confirm that they had in no way exaggerated. We set off to the north on Ruta 40. Only a few km out of Cafayate in the vicinity of the La Darsena reservoir we found a Parodia sp. as well as fine plants of Acanthocalycium. On the right hand side of the earth road was henceforth found over some 90 km the broad flood plain of the Rio Calchaqui which gave the impression that it sometimes even overflowed to the left hand side of the road.

Near Molinos we came across still more places well populated with Gymnocalycium spegazzinii, which for a certainty may not be allowed to exist much longer. Shortly before San Jose des Escalchi a football pitch had been made and for that purpose the ground to the left of the road had been cleared and flattened. Since this area appeared to be Gymno territory we searched around where the foot of the hills started to rise. Then as we came to the cleared debris dumped at the margin of the future football field, we found heaps of Opuntias and Gymnocalycium spegazzinii which had been bulldozed up. I could not bring myself to leave some specimens there and I replanted them at some distance from the football field.

From our hotel in Cachi we had a magnificent view of the peak of Nevada Cachi at 6380m. Since very little precipitation falls in winter only the uppermost peak had a complete covering of snow. At breakfast next day the thermometer scarcely stood above freezing point. Our route should now take us over the plateau of Cachi Pampa in the direction of Salta. Some km to the north of Cachi, we therefore turned off to the east, along Ruta 33, along which we should also find the upper limit of Gymnocalycium spegazzinii. On the steady ascent towards Payogasta we were able to locate several populations of G.spegazzinii, starting at an altitude of 2500m, which became steadily fewer up to an altitude of 2800m, and then they disappeared completely. Since we wished to stop overnight in Cafayate again, we made a good pace southwards through the Quebrada de Cafayate. South of La Vina we again started to look for cacti and in this area we found fine specimens of G.delaetii and G.pflanzii which should really grow much further to the north-east. Further along the road to the south there were again and again habitat locations of G.spegazzinii, at which plants of all sizes and the most variable forms of spination, stood in abundance. Since we had not completed our notes and photographs we had to search round with a flashlamp at the last location before Cafayate.

On the next day we would once again look for G.spegazzinii along the stretch between Cafayate and Quilmes. As G.spegazzinii continued southwards along Ruta 40 it was of interest to us whether they displayed any differences from the finds around Amaicha and in the north. South of Cafayate we made some fine discoveries of these plants, among others an extremely rare double cristate of extraordinary size. Certainly the habitats in the close proximity of the road in the stretch of of Ruta 40 south of Santa Maria are unfortunately endangered on account of the road widening being undertaken there. Since the southernmost locations of G.spegazzinii are known from Capillitas, we searched to find out if these plants also occurred in the mountains to the west of Punta de Balasto. Fortunately we made a find after the turn-off to Capillitas, but these plants no longer grow there in the same manner as in all previous habitat locations in the flood plains of the streams and rivers, but here they colonise some gravelly hills and extend up the hillsides to some extent. It was quite evident that there was no variation in the type of spination here. Even small plants were definitely longer and more densely spined than at the previous habitat locations. Thus here at the limit of the distribution area a truly uniform form appeared to have developed. Whether this should be regarded as a variety or only a form, needs to be settled only after further comparative observations.

From J.Piltz, H.Till, G.Neuhuber, F.Kuhaas, W.Papsch, and L.Bercht we received much useful advice and information; for which they are once again we most heartily thanked.

.....from W.Knoll, G.O.K. Journal, June 1974

Reaching Cafayate I again took a room in a simple guest house and set off straight away in the afternoon on the search for cacti. ... On the return way I found G.spegazzinii WO 15, which always grew under bushes, scarcely visible, hidden well down into the sandy ground. The great variability in this species is quite incredible, even in the body colour - I was able to find even pure violet coloured plants.

.....from F.Kasinger

On the enclosed habitat slide of G.spegazzinii you can see that the body is quite a plain green colour, whilst the spines are fairly short and cover very little of the plant body.

.....from H.Middleditch

The few inches of branched stem seen immediately behind this plant would suggest that it is growing very close to the base of a bush which may afford some degree of shade.

.....from F.Vandenbroeck

The plant shown on this slide from F.Kasinger has indeed a body of bright green colour and the spination is surprisingly open. To understand this, one should be acquainted with the growing conditions of the specimen, but anyhow I believe that this plant must be growing in “lush” conditions. All plants growing in dry exposed conditions develop an impressive spination. The colour of the plants I saw round Cachi is a somewhat glaucous green to khaki green, whereas the plants near Quilmes tend to be very greyish. At this place the plants were often overlooked because their colour resembled that of the surrounding pebbles. The growing point of the plant may indeed be covered with coarse, greyish wool.

.....from K.Gilmer.

My recollection of the places where we saw G.spegazzinii in the course of our visit to Argentina is that these plants usually grew under a bush.

.....from R.Ferryman

When we met with this species in flat sandy or quartz areas, we saw G.spegazzinii growing close to the ground, sometimes almost buried. The aridity of such areas meant that little else was growing in the vicinity. Occasionally the plant might be growing under a bush, but these bushes looked as if they would offer the G.spegazzinii little protection from the elements. More often than not, the bushes were dead or appeared to be dead - no leaf, no growth. But even some of these bushes may not have completely expired, since we did see some of these “dead” bushes which put on leaf when rain appears. Occasionally the relics of dead branches were all that was evident, or the bush would be alive but leafless, offering no shade to the G.spegazzinii under the prevailing conditions of drought. The plants may often start life under a bush, but then the life-span of the bush is much less than that of the Gymnocalycium, to the extent that very rarely is a

mature plant found with such protection.

But G.spegazzinii is in no way restricted to a habitat of flat ground of sand or quartz in the company of bushes. It can be found growing between rocks and in such places many plants became hemispherical due to good growth. I never saw a plant taller than wide, but would not be surprised if a plant achieved this, given a good location under the shade of a growing bush. There were places where we found these plants where the ground lay on a gradient, so that it could be imagined that a local downpour might sweep away any loose seeds, which could conceivably come to rest against the base of a bush, and germinate there. It would be too sweeping a statement to say that G.spegazzinii always grew where seed could have been carried by a local downpour. Certainly I do believe that flat areas where we saw these plants growing would offer excellent drainage, and although it is my impression that the amount of rain that can fall at any one time in a limited area can be quite considerable, I do not see a sheet of water sweeping across any of these flat areas and in this way distributing the seed of G.spegazzinii growing there.

.....from K.Preston-Mafham

Now as to G.spegazzinii being found in flood plains of rivers and streams. Flash flooding can occur just about anywhere, and gulleys high up slopes could channel water on to plants lower down yet still well above the valley floor itself. When I was in Humahuaca it rained torrentially for over nine hours, and next day considerable quantities of earth and rock had been washed across the main road southwards. Gymnocalycium spegazzinii does often seem to grow where alluvial fans are formed below hillsides, the fans themselves showing the effects of erosion and outwash by being conspicuously scarred with numerous small (1-2 feet deep) gulleys. However, north of Tafi del Valle the plants occurred on very normal slopes with other plants such as Parodia microsperma and Acanthocalycium variiflorum, all side-by-side with lots of very small bushes. In the Quebrada del Toro, G.spegazzinii also occurs on steep hillsides side-by-side with Parodia stuemeri, while further up the Quebrada del Toro it is on alluvial fans also alongside P.stuemeri and with many Pyrrhocactus umadeave, all mixed up with one another on a seemingly random basis. However, G.spegazzinii did seem to be more numerous on the south side, below the road, with many L.chrysantha and here they both definitely grow on areas where water and mud must have flowed over them at certain times from higher up. In the Quebrada de Cafayate G.spegazzinii grow alongside many Acanthocalycium thionanthum without any apparent ecological differences, also in flattish ground which would become muddy in heavy rain. North of La Poma they were in much more gravelly soil, with A.chionanthum in thousands and a few Lobivia haematantha, all growing together side by side among low bushes 1-2 feet high and up to a yard across. This was on a big and relatively flat area, with no obvious signs of erosion by water and nowhere obvious that this could come from - it was a very wide valley here.

These Gymnocalycium grow both in and out of the shade of bushes at most localities. Low down the Quebrada del Toro near Chorrillos, I found them in grassy and stony areas of small hillocks by the road, along with Cleistocactus jujuyensis. This is thus very different ecologically from some of the bare open alluvial sites, and with considerably more rainfall than the plants higher up the Qu. del Toro ever get, showing that this Gymnocalycium is adaptable and not restricted to one specific habitat type. Near Alemania the valley is quite narrow and all the cacti in the area grow under bushes for the simple reason that bushes cover just about everything on the valley sides and bottoms, except for the river itself. As the bushes have recurved hooks, looking for cacti in this area is extremely unpleasant. The ridge-top site just south of Cachi is again rather different, as no water would ever run over the plants which stand in full sun. The ridgetop itself is flattish to slightly humped, and 10-20 metres wide. The plants grow cheek-by-jowl with A.chionanthum, Parodia heteracantha and P.aureicentra omniaurea.

.....from H.Middleditch

The above account by B.Schweitzer reports several further locations for G.spegazzinii from the Calchaquies valley, which suggests that this species probably occurs here and there along most of the length of this valley between Cafayate and Cachi.

The flat area immediately north of La Poma which is of unusual extent for an otherwise relatively narrow valley, appears to owe its origin to a blockage of the river valley downstream of this site so that it became a lake whose bed was eventually filled with erosion debris.

.....from I.Bowman, Desert Trails of Atacama, American Geographical Society, 1924

The site of Poma is the bed of a temporary lake, now partly dry land, partly swamp, where the hollows of the former lake floor have not yet been completely filled up or drained. The origin of the lake is found in geologically recent volcanic action. Four miles south of La Poma are twin volcanoes, whose lava flow first dammed up the river, and a lake several miles in extent was brought into existence. With the cutting down of the diverted stream into the rock at the western side of the valley, the lake was drained. Thus it came about that an extensive area of flat land in the midst of mountains, watered by many streams from the adjacent high cordilleras, has given rise to a settlement far removed from any centres of population.

The valley behind the lava dam is topographically well adapted to the control of livestock feeding. At Poma alfalfa is the chief crop. From June to August it is too cold to irrigate the ground, for the water freezes during the night; if it were allowed to freeze in the alfalfa meadows it would destroy them.

.....from G.Charles

In cultivation G.spegazzinii is one of the slowest growing species, never seeming to flourish like most of the other Gymnos. Flowers are produced one at a time. A big plant in my collection has just put out its first offset. The clumps of this species which I saw in habitat could well have been groups of seedlings. All my cultivated plants are similar in having very poor spines by comparison to those on habitat specimens, which were often spectacular.

.....from R.Ferryman

Of those places where we saw G.spegazzinii, the Quebrada del Toro was the only one where plants were seen in flower. Indeed it seemed to be the best looking plants that were in flower. not only were they in flower, but also in fruit. There was little doubt in my own mind that the fruit was “this” season’s fruit, not a residue from “last” season. From this we concluded that the flowering season for G.spegazzinii started here sooner than at any of the other places where we saw this plant. I can be quite specific that none of them carried more than one open flower, although of course many of them had more flower buds which could well have opened in the following days. The flowers were all very short, with a very short tube, just like G.marquesii in my own collection. Peculiarly enough, the flowers did not have circular opening - it was quite noticeable that they looked as if two sides had been pressed together. This could not be attributed to the spines restricting the flower opening, because the spines curved back towards or against the body. My own cultivated G.spegazzinii, on the other hand, has flowers which are fairly tall but open wide!

In my own collection, G.spegazzinii only ever produces only half open flowers, according to my recollection. This mode of flower opening is, I suspect, common or characteristic for this plant as we saw it in a number of locations in

habitat at various times of day without seeing a wide open flower. Some Notocactus, for example, appear to wait until mid afternoon to open fully but G.spegazzinii was not obviously influenced by time of day or temperature in its flower opening.

.....from K.Preston-Mafham

We came across this plant at several locations in the course of the trip to north-west Argentina. At most of these places the plants were budding up, but not at all of the locations. On the first visit to the Quebrada del Toro we found a plant in flower some way below Chorrillos and on the second visit we found one other, some way lower down the valley. There was only one flower open on each plant. In the upper part of the Quebrada del Toro they were not in bud. They were so shrunken that they had withdrawn into holes in the ground with their tops below the surface of the ground. Near Cafayate we also saw a great many plants in similar condition and they, too, showed no sign of buds. When the whole party found G.spegazzinii at a spot close to Cachi, these plants were in bud. When I returned on my own a couple of days short of four weeks later, there were immature fruits on these plants, which must have flowered in the intervening period.

.....from H.Middleditch

It must be all of a dozen years or more ago that I participated in a joint order to Knize and among the acquisitions thus made there was an ex-habitat plant of G.spegazzinii. The root was a very robust carrot shape, nearly three inches long and about the same diameter where it met the body. The plant body was hardly more than a slight crown at the top of the root, barely hemispherical. The epidermis was a very dark bluish green indeed. Over the course of the intervening years it has survived, rather than grown, showing virtually no inclination to get itself established. For practical purposes it has made no real new growth. Despite displaying this obvious dislike for its new accommodation, it does occasionally manage to push out an odd flower, with long, slender, very bluish flower tubes.

.....from M.Muse

Altogether I have six plants of G.spegazzinii of which B.34, P.43, and a rather different looking plant labelled WR3 are of flowering age. The plants of B.34, P.43, P.43a, and P.43d all have appressed spination like the plant in Abb. 145 in the Lexikon; these spines are a mix of pink and slate grey when wet. The crown is scarcely sunken and covered in dense yellowish white wool. The imported plant of Lau 530 has more projecting spination and that of WR3 even more so, but the form of the flower is constant.

.....from J.Arnold

Of G.spegazzinii I have two large plants in 6 inch pots. One is an old import, possibly from Frau Muhr. It has a flat body and long, arching, light coloured spines. The second plant is FR 33, about five inches tall with shorter and more outstanding spines. Also I have two seed raised plants in 4 inch pots, which came from Jumanery many years ago, both very flat with with long, dark (almost black) spines very closely pressed to the body. Another plant was grown from seed which came as ISI 1509 collected by D.Herzog at Cafayate; this plant is now about 3 inches across and less flat, being about 2 inches tall. It has very outstanding spines which are light coloured but not very long. Lastly I have two plants of P.43a of about 3 inches diameter, very flat with long black spines closely pressed to the body, very similar to the ex-Jumanery plants. They are, then, a rather varied lot and must represent considerable variation in habitat. None have thick flattened spines like some extreme forms I have seen in photographs.

All these plants flower, but I have not found it to be the case that these plants only one flower at a time. At the time of writing, the two Jumanery plant have three flowers each, the ISI plant has two, whilst the Piltz plant has five with two additional buds! My recollection is that they mainly produce more than one flower at a time. The flowers are all similar but the buds are a darker blue-black on some. The flowers are typically long-tubed and not very wide opening, indeed I do not think that I have seen any flowers more than barely half-open. They are very solid and stiff, even the petals are rather stiff. Presumably this may have some effect on reducing transpiration in the hot and arid environment that it inhabits. I have looked at the flowers on two of the plants; these were not newly opened, being perhaps two days or even three days old. The pollen was copious and thick on the anthers. The stigmas were very low down in the tube. They were large and substantially formed. I would describe the disposition of the stigma lobes as claw-like. These were quite widely spread but very likely constrained severely from opening any wider by the anthers and the tube. Because of their size I am doubtful if they could open any more. One of the Jumanery plants had a stigma of 13 lobes and that on the Piltz plant had ten lobes. I feel that the stigma on the first plant was the larger and more substantial of the two, but then the plant itself is also much larger. Apart from that, the form and disposition of the stigma is very similar even though the plants are from quite different sources.

As far as the centre of the plant is concerned, I think it could be fairly described as spineless, but thickly covered in woolly felt. This can largely be washed off if watering overhead. The spines begin to emerge just outside the centre and are often half upright or even mainly upright - the latter mostly in those plants where ultimately the spines are not laid flat against the body. As the body is so flat, the emerging spines can make the top part of the plant fairly spiny looking. All the plants have grown significantly over the years so although they are slow growing they are not difficult.

.....from G.J.Swales

There are half a dozen plants of Gymnocalycium spegazzinii growing in my own collection. These were acquired over the course of a number of years from several sources. The most recent acquisition is a KK 1304, an imported plant obtained from Whitestones in 1980, which came from Salta province at 1500m. Also coming from Whitestones, in 1979, a plant of B.34 from Molinos, province Salta, at 1700m. A further imported plant came from Uhlig in 1977. In 1973 a seedling plant came from Billy Lucas in USA and in 1969 a small plant came from Czechoslovakia as G.spegazzinii v.major. Still with me is a plant raised from seed which I sowed in 1966.

The seedling plant from Billy Lucas is almost globular and about 2.5 inches in diameter, whilst my own seed-sown plant is nearer to a hemispherical shape but also about 2.5 inches in diameter. The other four plants are all elongated, up to almost 4.5 inches tall, the dark greyish-green crown being flattened hemispherical, whilst the lower section of the body is of an irregular columnar form, a corky grey-brown colour with quite deep horizontal wrinkles.

Only the plant which came from Czechoslovakia has spines which appear from all the way across the growing point. The other plants have a growing point which is spineless and covered with yellowish-grey wool and so conform fairly closely with this aspect of Werdermann's description of Echinocactus loricatus. The ribs on my plants are certainly almost flat. The KK 1304 has 15 ribs of which two start from about the shoulder; the B.34 has 13 ribs, the ex-Uhlig import has 12 ribs, and the v.major has 10 ribs. This range conforms nicely with Werdermann's figure of 10-15 ribs which he based on a batch of imported plants.

On the imported plants the new spines which are growing close to the centre of the crown point outwards, leaning well away from the vertical, whereas on the plant from Czechslovakia the new spines at the crown arise almost vertically, curving outwards but slightly from the vertical. But even on this plant they soon curve downwards so approaching fairly

close to the side of the body, so that it can be picked up with ease by holding the body between finger and thumb. There are few Gymnocalycium which lend themselves to being lifted, complete with pot, in this manner. Away from the centre of the crown the spines on the imported plants do point forwards and downwards "curving towards the body" as Werdermann observes. On the ex-Billy Lucas seedling there are some areoles with 9 spines but most areoles carry between 5 and 7 spines, always an odd number. No obvious onion-like swelling was to be seen at the base of the spines, but this particular feature is one which is not uncommon in many cacti from various genera; in any one species it may sometimes be present, sometimes not. The existence of this feature may simply be a reflection of how fast the spines are growing at the time the observation is made.

The flowers appear from within, or close to the edge of, the yellowish-grey wool which covers the crown. In this position the buds are unhampered in their development by the spination of the plant. The ex-habitat imports all carried one flower when the observations were made, whilst one bud was visible on the ex-Czechoslovak plant. One withering flower bud had just fallen off the B.34 leaving one open flower, so that on this occasion it might be said that these plants only had one flower out at a time. The flower shape is not really funneliform as the tube displays a slight urn-like swelling at part-height. But when looking at these flowers on a nice warm sunny, June day, the petals took on a quite narrow funnel shape and I do not recollect having seen any flowers on G.spegazzinii even as much as half-open their petals, certainly never wide open with the petals more or less flat. Because the filaments curve upwards and inwards they obscure the view down into the flower so that the stigma cannot be seen. However, when the flower shed by B.34 was cut in half, the stigma lobes were found to be wide open, not quite horizontal, which does not conform to Werdermann's observation of "stigma lobes barely radiating". It is possible that the stigma lobe disposition may be related to the age of the flower. Apart from this one feature, the detailed description of Echinocactus loricatus by Werdermann appears to be a quite good match for my own plants. It may be added that they are a remarkably slow-growing species.

.....from W.Withers

It must be about twenty years ago that I acquired a G.spegazzinii as quite a small plant and it will now be about 4.5 inches in diameter. It is a bright green colour and very globular in shape; the ribs are so blunt that they are nearly flat. The spines are short and all lie close to the body; they spread out like open fingers of a hand, all pointing downwards. It flowers pretty regularly every year with a very bluish colour to the outside of the tube. From a slide taken last year I see that it has two flowers fully open at the same time.

.....from H.Middleditch

Having seen the photograph of the flowering plant grown by W.Withers, it is quite clear that the petals are spread out and the flowers are well open. However, this does appear to be the exception as it seems to be the general experience that flowers on this species do not open their petals wide, and at best could be said to be barely half open.

.....from B.Schweitzer

My cultivated specimens of Bk 15, BK 18, and BK 31 have all flowered, producing one flower at a time. But on another occasion my BK 31 had three flowers open at one time.

.....from K.Gilmer

We did see G.spegazzinii in the Quebrada del Toro with more than one flower open at that time on a single plant. Not far from El Obelisco, in the Quebrada del Rio de las Conchas, we found a plant with a faded flower and also a young fruit - this in late November.

.....from F.Vandenbroeck

We saw plants with flower buds, plants with bright blue fruits, and in one case only with one single flower. Near Quilmes the G.spegazzinii were growing in company with Cereus aethiops, Tephrocactus weberi, Acanthocalycium brevispinum, Echinopsis leucantha, Trichocereus pasacana and Gymnocalycium saglionis.

.....from H.Middleditch

At The Chileans' 1995 Weekend a map of the Santa Maria, Calchaquies, and Conchas valleys was on display, on which were plotted numerous reported locations for G.spegazzinii. In this way it was demonstrated that G.spegazzinii is to be found throughout this valley system, both close to the floor of the valley and at accessible places on the mountainsides enclosing these valleys. Access routes ascending the valley sides are few and far between over this area, so that there may well be hundreds of thousands, or even millions of plants of this species over the untravelled sections of the valley sides. This species is also to be found in the Quebrada del Toro. At the upper end of the main valleys G.spegazzinii is reported from about 3100m north of La Poma and in the Quebrada del Toro, and up to 2800m on the ascent from the Santa Maria valley towards Capillitas [P.43c]. Both the Quebrada del Toro and the Rio Conchas empty into the Valle de Lerma. The Quebrada del Toro opens into the northern end of the broad Lerma valley so that the rain bearing winds from the south-east gain access to the lowermost part of the Quebrada del Toro, where they provide a relatively moist climate which does not support G.spegazzinii. In this way the distribution of G.spegazzinii here does not extend below about 1700m.

The southern end of the Lerma valley narrows steadily as the mountainsides gradually approach closer to the river until it becomes the Quebrada Cafayate, in which the R.Conchas runs. This Quebrada runs northwards out into the Lerma valley, so that it lies in the lee of the rain bearing winds from the south-east. Hence the limit of distribution of G.spegazzinii here is determined solely by altitude and the consequential annual temperature regime. Here it occurs down to an altitude of about 1400m, near Alemania. At no great distance to the north of Alemania grow both G.schickendantzii and G.pflanzii; G.schickendantzii extends over the western Pampas, the Sierra Cordoba, and is found on many of the Pampean Sierras, whilst G.pflanzii extends from Alemania to Paraguay and into south-eastern Bolivia along the valleys of the Rio Grande and Rio Pilcomayo. Neither of these species has been reported from the known distribution area of G.spegazzinii. Thus a dividing line between them can be drawn at Alemania.

By comparison, G.saglionis is to be found over a distribution area roughly comparable with that of G.schickendantzii, as well as extending into the Quebrada Humahuaca. However, G.saglionis is also found in the Quebrada Cafayate, as demonstrated by K.Preston-Mafham at the 1995 Chileans' Weekend by a slide showing G.spegazzinii and G.saglionis growing almost side by side. Gymnocalycium saglionis extends up into the Santa Maria valley where it is found in large numbers at Ruinas de Quilmes in the Santa Maria valley, at perhaps 1950m altitude. This represents an altitudinal and geographic overlap of G.spegazzinii and G.saglionis. But G.spegazzinii does extend to an appreciably higher altitude than G.saglionis and is to be found growing under some fairly harsh conditions, as the above accounts would indicate.

Despite the great variation in the body colour, in spination, in rib count, and in the extent of above-ground growth which is displayed by G.spegazzinii, there is no suggestion that there is other than a single species which extends over a considerable area of distribution.

ECHINOCACTUS LORICATUS By C.Spegazzini
Translated by H.Middleditch from Cactacearum Platensium Tentamen, Anales del Museo Nacionale de Buenos Aires Vol.XI Series 3a 1905.

Diagnosis. Hybocactus? Dull dark brownish grey-green, somewhat truncated obconical below, depressed hemispherical above, unarmed at the centre and very slightly depressed and clothed with thick velvety greyish woolly felt; ribs 13 broad rounded very blunt and continuous not very depressed with undulations; areoles elliptical sunken; spines often 7, thick rigid appressed and curved backwards and somewhat reflexed, greyish-brown. Flowers from the woolly centre, erect, externally lacking hairs, brownish-green, scales semi-circular with a hard scaly exterior [loricate], petals slightly fleshy more or less pinkish, with white stigma.

Habitat. Once only in dry place near La Vina, prov. Salta.

Observations. Species regarded by Schumann as a variety of E.denudatus Link & Otto, but in my long-held opinion differing from it and not the least comparable in habit, colour, and especially in the white stigma.

Body solitary, 14 cm in diameter and 6 cm tall, disc at the centre woolly, 3 cm diameter, ribs straight separated by very narrow intercostal grooves, 10mm broad above, 30 mm below; areoles in each rib 5, longitudinally elliptical 10 mm long by 5 mm broad, at first slightly raised greyish velvety later bare and sunken; separated at 7 to 10 mm intervals; spines 5-7 centrals plainly and always absent, semicircular in cross section flattened below very rigid 20-25 mm long by 1 to 1.5 mm wide, often somewhat curved reflexing and recurved, the lower superior not a great deal longer, dingy grey, minutely scaly-roughened, point bare, brownish. Flowers 70 mm long, external scales thick fleshy with pinkish-white margin, petals moderately thick more or less pinkish, stamen filaments anthers and style somewhat violet, stigma lobes 16 grubby white somewhat pinkish.

.....from H.Middleditch

This description follows the pattern which had been fairly traditional for much of the 19th century, of providing an official diagnosis which was followed by further observations. These observations would frequently repeat the data given in the diagnosis, often adding further detail, occasionally including data which would not entirely conform with that given in the diagnosis and from time to time even appearing to contradict it. Echinocactus loricatus subsequently became known as G.spegazzinii. From the accompanying accounts of later dates which describe finding this species in the field, it will be evident that it has been recorded from the valley of the Rio Conchas downstream from Cafayate, almost as far north as the approaches to Alemania. This description by Spegazzini quotes a finding place of La Vina, which lies further down the valley from Alemania and thus at a slightly lower altitude, i.e. at a lower altitude than any other reported location for G.spegazzinii. There does not appear to be any confirmation of this location from more recent field observations, although that does not rule out the possibility that this plant may have been found on the sides of the mountains overlooking La Vina.

ECHINOCACTUS LORICATUS Speg By E.Werdermann
Translated by H.Middleditch from Monat. der D.K-G 1930

The Botanic Garden in Dahlem is indebted to Prof. Hosseus in Cordoba, Argentina, for a number of rare species (also undescribed up to the present time) of which some flowered for the first time this summer and ought to be discussed in our Journal. Unfortunately many valuable and fine plants which Prof. Hosseus delivered to us personally in the winter of 1928/29 had fallen victim to a quite extraordinary cold spell during the period of conveyance and perished shortly after their arrival.

Two plants which arrived at the Garden in the year 1928 and which belong to Echinocactus loricatus Speg., have developed into imposing specimens with us and one of them produced several flowers during the course of the summer. This species was described by Spegazzini in the Annales del Museo Nacional de Buenos Aires Vol XI 1905. A translation of the concise latin diagnosis was published by A.Berger in the Monat. fur Kakteenkunde Vl XV 1905. In The Cactaceae Vol III, Britton and Rose presented a small illustration of a specimen collected by Spegazzini, together with a brief description, renaming it Gymnocalycium spegazzinii, since in their view the species name loricatus was already pre-occupied for the genus Echinocactus on account of the classification of Mammillaria loricata Mart. as Echinocactus loricatus by Poselger in 1853. The Spegazzini species was regarded by Schumann only as a variety of the certainly related Echinocactus denudatus Link & Otto. I regard Echinocactus loricatus Speg. as a valid species and agree with the view of A.Berger, to regard the genus Gymnocalycium only as a subgenus of Echinocactus. Also in our opinion there is no need to change the species name chosen by Spegazzini.

With the illustration I provide a more detailed description. The body of both plants arrived in a flat shrunken state. After a short period in cultivation it became almost completely globular. The larger plant is now ca. 12 cm tall and 11 cm broad. Colour grey-green, the lower half a grubby grey, somewhat corky and much wrinkled up by drought. Crown somewhat depressed, the growing point not overtopped by spines but covered with very short yellow-grey woolly felt. Ribs on the larger plant 11, on the smaller 10 [whilst this article was at the printers I had the opportunity to inspect a large number of fresh imports. The rib count of individual plants varies between 10 and 15 - Ed. Monat. der D.K-G], pretty well perpendicular, only slightly raised, even at the crown, but separated by a well defined longitudinal groove, markedly cuneiform and almost completely flattened towards the base. becoming ca. 4 cm broad. In the upper part of the body occasionally divided by short cross-furrows only 1-2 mm deep. Areoles somewhat raised, ca.1.5 to 2 cm apart, ca. 10 mm long and 6 mm broad, with grey wool when young, later becoming more and more bald. Spines all radial, sloping forwards and spreading downwards, usually somewhat bowed and curved towards the body; numbering 7 (5), the uppermost pair the shortest, the unpaired one the longest, up to 5.5. cm long, pointing downwards. Colour pale reddish brown, coated with rime, rough, sometimes darker at the tip, often dark brown or foxy-red in the crown, stiff and awl-like, in cross section circular or only slightly flattened, swollen onion-like at the base.

Flowers in the crown one after another from young areoles, 6-7 cm long, opening to 5 cm wide, funneliform. One flower was already open at 3 cm overall length. Pericarpel and tube 3 cm long on a 6 cm long flower, matt green, somewhat coated with rime. Relatively few scales, naked in the axils, more or less half-moon shape, greenish with narrow, pale pinky-white margin and tiny, slightly projecting, dark brown point; in the upper part of the tube becoming longer and transforming into the outermost flower petals. Outer petals oblong-lanceolate, 2-3 cm long, 8 mm wide at the broadest part, narrower at the base, whitish or with a pink sheen with an external pale green to brownish mid-stripe, a delicate purple-violet at the base, the whole margin or only at the upper end faintly denticulate and with a tiny, usually

somewhat reddish, pointed tip. Inner petals ca. cm long, 7 mm wide, whitish to pale pink with darker midstripe, a delicate purple-violet at the base, margin almost entire, with insignificant pointed tip. Filaments in two series, one short, upright, at the base of the style and about 2/3 the length of the style, the other series distributed over the tube, curved inwards, shorter than the petals, the longest ca. 1.5 cm long. Filaments and throat purple-violet. Anthers pale yellow. Pistil columnar, ca. 2 cm long including stigma, shorter than the longest filaments. Style ca. 1.3 cm long, purple-violet but paler than the throat and filaments. Stigma lobes 11-12, ca, 7 mm long, whitish, barely radiating. Ovary elongate to short egg-shape, 6 to 7 mm long, 4 mm wide above. Funiculi branching. Fruit and seed unknown.

As habitat, Spegazzini quoted Argentina, prov. Salta, dry places near La Vina. Prof. Hosseus collected it in the high mountains of Salta prov. under No.234.

.....from H.Middleditch

Werdermann voices his opinion that "there is no need to change the [species] name chosen by Spegazzini" i.e. from Echinocactus loricatus to Gymnocalycium spegazzinii. According to C.Jeffrey, "An introduction to plant taxonomy" 1968, p.80 if a species is transferred to a new genus then "the oldest ... epithet must be used, but it must be transferred to the correct genus to give the correct name for the species. In short, for taxa of the rank of species and below, epithets have priority, and the correct name is provided by a combination of the oldest available epithet with the correct generic name". However in transferring this species from Echinocactus to Gymnocalycium, Britton & Rose did not use the oldest available epithet. Even if the requirement to use the oldest available epithet was introduced by the ICBN after 1923 (the publication date of G.spegazzinii) then, again according to C. Jeffrey, "although the ICBN is modern, most of its provisions are retroactive". What precisely is the situation with the name of this species?

.....from R.Mottram

When Spegazzini validly published Echinocactus loricatus in 1905, he created an illegitimate later homonym of Echinocactus loricatus Poselger, 1853. (In terms of the ICBN, legitimacy means available for the purpose of priority.) Britton & Rose therefore published Gymnocalycium spegazzinii as a substitute name (or replaced synonym) for Echinocactus loricatus Speg. The foregoing quote from Jeffrey is correct, but omits the word 'legitimate'. The wording of the 1988 Code is:

Article 11.3 "For any taxon below the rank of genus, the correct name is the combination of the final epithet of the earliest legitimate name of the taxon in the same rank, with the correct name of genus or species to which it is assigned"

The epithet 'loricatus' used by Spegazzini in 1905 was not legitimate, and as there was no other epithet available in this case for this plant, Britton & Rose were free to supply a new one, based of course on the description and type of the original Spegazzini name.

.....from H.Middleditch

If the "no.234" quoted by Werdermann was indeed a Hosseus field collecting number, then it would suggest that Hosseus undertook collecting trips in the field, rather than just accepted material collected by contacts in the field. The likelihood of being able to refer to any of Hosseus' field collection documents at this distance in time would seem to be rather remote.

This plant was also offered by Fric under the name of G.horizonthalonium. In Aztekia 14 1991 there is a reproduction of a Fric seed list which does not appear to be dated. However, this list includes more than one illustration bearing the date 1929, as well as an entry reading "G.horizonthalonium Fric sp.n. - Echinocactus loricatus - G.spegazzinii?". The accompanying 1991 commentary accepts that this Fric name is invalid.

[G.spegazzinii was discussed and illustrated in Chileans No.20 pp.16 et seq.]

GETTING CARRIED AWAY BY THE ANTS. From N.Gerloff

When I was in Rio Grande do Sul in January 1993, we made a stop at about km 30 along the road from Cacapava to Lavras, which is roughly the habitat location for HU 7. At this spot, Gymnocalycium denudatum Gf 332 and Frailea gracillima Gf 333 are found growing. Whilst I was there, it struck me as rather peculiar that the various colonies of Gymnocalycium seemed to lie in a line between the few small. low, rocky outcrops. At that time I saw very few ants around and the fruits on the Gymnocalycium were not yet ripe. My friend who lives in Rio Grande do Sul paid a visit to the site in February but instead of being able to collect seed from the Gymnocalycium fruit he found them all empty, whilst the ants were plundering the seed from the nearby ripe Frailea fruits. Once having seen the large number of ants busy collecting this seed, it then became easy to follow the moving lines of ants along the ground. They went from one colony of Gymnos to the next, and so on. In consequence I now believe that the ants are involved in the distribution of the Gymnocalycium. The contents of the Gymno fruit would be readily consumed, since the white flesh between the seeds is sweetish.

Not far from Dom Pedrito I came across Gymnocalycium denudatum Gf 217. It grows in company with Notocactus sellowii, N.ottonis, and N.linkii. Right next to one particular stone there were plants of N.ottonis and N.linkii growing side by side. How did it come about that they grew so close together without any transition forms to be seen? I lifted the stone and underneath it the ground had been tunnelled into passageways by the ants. The ants must have carried off the fruits from elsewhere, and with them the seeds. Now and then they must have dropped a seed on the way back to this spot, from which the seedlings grew ever closer together. I have often seen this situation in Rio Grande do Sul but only taken a photograph on a few occasions.

At another spot, some 12 km east of Bage, on the way to the Hacienda Quebracho, the road lies for a short distance roughly one metre below the surrounding land. On the embankment at the roadside, close to the fence, there were several ant nests each in the form of a hummock. On the sides of these hummocks grew N.mammulosus Gf 84, N.ottonis Gf 85, and G.denudatum Gf 86. The N.mammulosus was already 25 cm tall and was probably the oldest plant at that spot.

.....from G.Charles, At The Chileans' 1993 Weekend

During our trip to Argentina in 1992 we had made a stop at Chepes. From here we took route 28 in the direction of Patquia. Some 8 km north-west of Chepes we stopped to investigate a low hill, a rib running off the main mountain. Here we found plants of Gymnocalycium castellanosii (possibly bozsingianum), some being tucked right under overhanging rock, where it was very difficult to envisage a seed being able to find its way, unless it had been carried there by ants. Here, and elsewhere, we found Gymnocalycium on steep rocky faces where again there seemed to be no way for a seed to

reach those particular spots unless it had been dropped there by ants. At many of these places I looked to see if there were signs of older plants at higher spots on the rock, from which seeds may have fallen and then lodged part-way down the rock slope. But usually there were none, which also served to convince me that ants had transported the seed. But the most compelling reason for this belief was that whenever we found a Gymnocalycium fruit which had ripened and split, the ants were already there, removing the seed. Or they had been there before us and the pod was empty! So much so, that we rapidly came to the conclusion that it was a waste of time trying to collect Gymnocalycium seed from a pod that had already split. If we wanted to collect Gymnocalycium seed, we had to pick on a fruit which was not yet split.

.....from P.Down

Our trip to Bolivia was timed with a view to getting to many plants when seed was ripe, but the local ants had perfect timing on seed ripening, they often beat us to the seeds or had to be removed from the fruit whilst we were in the process of collecting the seed from it. In the village of Millares, just south of Sucre, we found Gymnocalycium pflanzii v.millaresii with ripe fruit whose seed was being collected by ants as we watched. We think that they could empty a seed pod within an hour judging by the progress we observed in the time we were there.

But this is not the first experience I have of ants collecting seed. My father used to raise a lot of seed for me and one day observed much ant activity in his propagator. The ants were collecting the cactus seed from the seed pans in which they had been sown and were marching off with them. We managed to save quite a lot of the seeds but it took about three years before we could recognise the members of the mixed collection that resulted.

.....from M.Nilsson

During a visit to Argentina in July 1993 we were able to travel from Iturbe to Iruya, where we spent about a week. I saw a lot of dried flowers on the large Echinopsis there but all the fruits were empty, the contents having been taken away by the ants. We never found fruit with ripe seeds on any Soehrensia, only dried up remains of what were obviously previous years' fruit which held only 5 to 10 seeds at the most. Rarely did we find fruit containing ripe seeds on any Rebutia, the ants having taken it all. In my own collection, if I fail to collect the seed from my Rebutia immediately it is ripe, the ants that live in the pots in my greenhouse will take all. The ants also spring into action and remove seeds from the fruit of my Acanthocalycium when it splits. On one occasion I came back from vacation and found that all my Lobivia fruit, which I had carefully encouraged to set at flowering time, had been pilfered by the ants.

.....from B.Holldobler & E.O.Wilson, "The Ants" 1990

Harvesting ants do not manage to carry all the seed they collect back to their nests.

.....from "Harvesting Ants and Trapdoor Spiders" By J.T.Moggridge 1873

As ants often travel some distance from their nest in search of food, they may certainly be said to be, in a limited sense, agents in the dispersal of seeds, for they not infrequently drop seeds by the way, which they fail to find again. Also among the litter which they deposit in front of the entrances to their nests, a few sound seeds are often present. In many instances these grow up and form a colony of stranger plants, foreign to the wild ground in which the nest is usually placed.

I have myself on many occasions thrown seeds in the track of the common English ants, and my experience was, up to the summer of 1872, similar to that of our most able observers, such as Huber, Gould, Kirby, Spence, and F.Smith, whose personal investigations had found no trace of harvesting. By chance I have become acquainted with a curious exception to this rule. I was gathering some fresh samples of the common sweet violet and in pouring the seed out of my hand into the paper bag made to receive them, a few were spilled on the ground. A short time afterwards, I was greatly surprised to see some of those spilled seeds in motion, being carried by the common black ant (Formica nigra) into its nest. On seeing this I hastened to get some more fresh violet seeds, and also a quantity of other sorts of seed, then scattered these where the others had been. After watching for half an hour, a few of the violet seeds were carried in, but not one of the other sorts of seed. I repeated this experiment twice afterwards on a different colony of ants and obtained exactly the same result.

At the time of writing this note I was unaware that the fact that certain English ants collect sweet violet seeds had been observed by R.Wakefield in 1832, this being communicated to the Linnean Society in 1854 (Proceedings ii,293) "I am inclined to believe that they collect these these particular seeds ... for the sake of some juices which they may obtain from the fleshy appendage attached to the seed".

Atta structor and A.barbara do not employ any materials in the construction of their nest, simply excavating it out of the earth itself. The mounds which may frequently be found at the entrance to their nests are nothing more than rubbish heaps. These consist in part of the earth which the ants bring out from their nest when forming the subterranean galleries, but principally of plant refuse such as the chaffs of grasses, empty capsules, and the like.

It was the sight of such a refuse mound and an examination of the materials which composed it, that gave me the conviction that large stores of seed must be hidden below in the nest. Therefore I opened a nest of Atta Barbara in search of granaries and seeds. My first attempt was made in a rather deep bed of soil and the galleries extended so far on either side and in a downward direction, that I failed to reach any chambers or granaries. I then selected a nest where hard rock lay closer to the surface, where I came upon large masses of seed carefully stored in chambers prepared in the soil. In this nest were seeds taken from more than twelve distinct spp. of plants belonging to at least seven separate families.

I was greatly surprised to find that the seeds, although quite moist, showed no trace of germination even though self-sown seeds of the same kind were coming up abundantly in gardens. The fact of the sound condition of the seeds in the granaries seemed to me so very strange that I determined to pay special attention to the subject. With this I collected and carefully examined large quantities of the grain and seeds taken from the stores of twenty-one distinct nests, at different times between 29 October and 5 May. Out of the thousands of seeds taken from these nests, I found only twenty-seven in seven nests which showed signs of germination, and of these eleven had been mutilated in such a way as to arrest the growth.

When seeds do germinate in the nests, it is very curious to see that the radicle - the first growing root - is gnawed off so that growth is checked in its earliest stage. They are then brought out from the nest and placed in the sun to dry and after a sufficient exposure, carried below into the nest. The seeds are thus in effect malted, the starch being changed into sugar, and I have myself witnessed the avidity with which the contents of seeds thus treated are devoured by the ants.

.....from H.Middleditch

It has been noted above by Holldobler & Wilson, and observed in the field by Moggridge, that ants drop by the way some of the seed which they collect in order to carry it back to their nest. That the occasional seed will germinate at the spot where it is dropped along the route taken by the ants has been observed, above, by Gerloff. At the ant nest, out of the hundreds and thousands of seeds eaten by the ants there may occasionally be one or two which are discarded or dropped when they are still in a sound condition, and could then germinate on the nest itself.

.....from A.Hofacker

In the course of my travels through Rio Grande do Sul and Uruguay it has been easy to see just how much of the land has been put to use for agriculture. Fences stretch for hundreds of miles along either side of the roads, enclosing huge fields in which cattle or sheep graze. Between the road and the fence there remains a strip of a few metres in width and it is here where cacti may be found growing. It is here, too, where the ants may build their nest. In the north of Uruguay, I came across an ants nest by the side of the road on which were growing at least a dozen good sized plants of Notocactus (Wigginsia)

.....from H.Middleditch

It was suggested by Wakefield 1832 (above) that the specialised appendage on certain seeds would be recognised by the ants as a source of nourishment, thus attracting their attention. This idea was taken up by later writers.

.....from R.Sernander, Outline of a Monograph on the European Myrmecochores. From Kungl. Svenska Vetensk Akademiens Handlingar Vol.41 No.7 1906

The knowledge that ants collect seed is really very old. Some species of ants, especially those in the countries bordering the Mediterranean sea, store great quantities of fruit and seeds in their underground habitations. This peculiar habit of the ants appears to have already been observed in ancient times. It is recorded by Oriental, Roman, and Greek writers.

The collection of seeds by ants was discussed scientifically for the first time by Ch.Lepes in 1866 and by J.F.Moggridge in 1873, which demonstrated that Aphoenegaster barbara and A.structor, which are common in Mediterranean lands, annually collect a vast amount of various sorts of fruit and seed. Likewise E.Andre and A.Forel have published contributions to this subject. At a much earlier date a similar habit was was known for some Indian species of ant, especially Pheidole providens, and data about them has already been reported in the scientific literature, namely by W.H.Sykes and by Hope.

Moggridge mentioned that he had observed ants with seeds of Viola odorata, and J.Lubbock in his well-known “Ants, Bees, and Wasps” wrote that he had made the self-same observation in relation to this very species of Viola and Lasius niger. On the island of Gotland, G.Adlerz had found seeds of Linum catharticum in nests of Tetramorium caespitosa and seeds of Polygala sp. in nests of Leptothorax acervorum and Formica fusca. From Algeria E.Andre wrote about this in 1881, and others have later confirmed these views. Of special interest was the observation that certain seeds possessed a special organ or peculiarity, on account of which the attention of the ants was attracted and to which they also owed their distribution.

In regard to the transportation of Viola seed, Moggridge suggested that perhaps the seed appendage was the source of attraction: “or for the sake of some juices which they may obtain from the fleshy appendage attached to the seed.” In 1876 O.Kuntze observed seeds of Cassia papaya being carried by ants and he attributed this transportation to the fact that the caruncula of the the Cassia seed perhaps excerted a real attraction upon the ants.

An extensive review of available observations was undertaken by A.von Kerner in 1898. He demonstrated that the seeds of many of the plants concerned possessed appendages, which in his opinion served as a lure. He provided sketches of some of these seeds. Unfortunately he provided little of the empirical and experimental data on which he had based his statements. Only two direct observations had been conducted on transport by ants and one of these was in the Innsbruck Gardens.

In a discussion published in 1900, G.Lagerheim mentions that he had found the seeds of Viola odorata and V.hirta being transported along a track by Lasius fuliginosus. He demonstrated that the appendage of the Viola seed contained an oil, which probably functioned as an attractant for the ants, and that perhaps the sterile flowers of the Melica inflorescence served as a lure. It has been shown by R.H.Lock that the similarly furnished seed of Turnerea ulmifolia in Ceylon were almost certainly distributed by the ant Pheidole spathifera.

In the course of my studies towards the end of the last century, dealing with the various forms and manner by which the scandinavian plants were today distributed in the wild, I quite rapidly came to the conclusion that the ants play a very significant role in the distribution of the seeds and the fruit of various plants. For a significant number of plants, I have been able to establish that their normal method of distribution is secured by means of a particular feature, specifically in the form of a structure such as I have described in connection with the species concerned, with the proposed name of Elaiosome (that is, oil body), and this material stimulates the ants in such a way as to achieve a natural distribution process. These plants, which have also proved to be Myrmecochorus, often possess in additional several common and noticeable characteristics in their organisation and in their state of development.

It will be evident from the following pages that by far the largest part of those seeds which have been seen transported by ants, were provided with the very bait which has been defined above. From this there remains no doubt that in Nature it is just these seeds which are most sought after by the ants.

[There follows an extensive, detailed, and comprehensive account of the work and observations undertaken, which resulted in the proposed term “elaiosome”.]

.....from F.E.Weiss, The Dispersal of Fruit and Seeds by Ants. New Phytologist, 7,1908

Many if not most of the seeds collected by ants would be carried to the nests, around which Sernander often found the seeds thrown out with the elaiosomes bitten off. But many seeds are left on the way, as Sernander shows by a diagrammatic figure of the occurrence of plants bearing myrmecochrorus seeds in the vicinity of an ant hill. To find out the number of seeds dropped by the way, Sernander staked out a square meter on a path leading through a wood in which Melampyrum pratense was growing. The said path was largely used by ants at the time when the seeds of the cow-wheat were mature and he counted on his square metre no less than twenty-eight seeds which had been left behind.

.....from H.Middleditch

Presumably a proportion of the seeds dropped en route would germinate and grow on, producing the same sort of line of plants observed (above) by Gerloff in Rio Grande do Sul.

.....from E.Ulbrich, Biology of fruit and seeds, 1928

It has long been known that ants harvest the fruit and seed of many plants. We denote as myrmecochores those plants whose fruit, seed, or other reproductive organs are distributed by ants. The term was coined by Sernander, originating from the Greek, Myrmex = ant and choreo = I wander. The feature possessed by those fruit and seeds which are dispersed by ants, we describe as myrmecochory, the plants themselves as myrmecochores.

For many plants we know of no other dispersal provisions than myrmecochory. Such plants are regarded as obligatory myrmecochores. Usually they can be recognised as such at first glance from their bearing, habit and flowering season. In addition there are many plants whose fruit and seed are harvested and transported by ants, but which possess other methods of seed dispersal. These sort of plants are described as facultative myrmecochores.

All myrmecochorus seeds, fruit, or other structure connected to the reproductive organs, possess a particular feature, which make them attractive to ants, so that they gather them. The majority of fruit and seed display a special appendage which contains material which is readily taken by the ants. Since in most cases this material is a fatty oil, we describe this structure as an "oilbody" or an elaiosome. The morphological nature of this structure is very variable.

Myrmecochorus plants are entirely dependant upon ants for their distribution, since they possess no other adaption for dispersal by wind, water, or other fauna and also have no arrangements for self-dispersal of their fruit and seeds. They are readily recognisable from the following characteristics: they flower early in the year and ripen their fruit and seeds very rapidly. Since in the north temperate zone the main collecting season for ants falls in the late spring and early summer, the fruit and seeds ripen so rapidly that it is just at this time that they are made available to the ants.

In order to make the fruit and seed readily accessible to the ants, the fruit stalk becomes limp or arched and bends over towards the ground (e.g. Primula aculeis, Anemone hypatica), or after the flowering period the whole plant elongates and because of the non-woody stem it falls to the ground and lies on the earth (e.g. Ornithogalum umbellatum). The ants crawling around on the ground then have ready access to the fruit and seeds.

In a small number of plants no outwardly recognisable oil body is formed in the shape of a swelling or appendage to the reproductive organs. The fruit or seeds are nevertheless keenly collected by ants, since there is material held within the fruit pod which the ants appear to relish. Otherwise the plants display all the morphological features of an obligatory myrmecochore.

.....from H.Middleditch

From this last paragraph one may deduce that the existence of some protrusion at or near the hilum of a seed which has been observed to be collected by ants, does not necessarily mean that that protrusion is an elaiosome, since some other component of the fruit may be the effective ant attractant.

.....from A.J.Beattie, Evolutionary ecology of ant-plant mutualisms. 1985

The anatomical and morphological differences between elaiosomes and the larger appendages called arils are often subtle and confusing. This is reinforced by the dispersal agents, which are thought to be ants in the case of elaiosomes and birds in the case of arils. Some arrilate diaspores from forest floor plants have been seen to be taken by birds at some places and by ants at others. The abundance and variety of two-stage systems suggest that in many cases dispersal is a two-stage process: displacement and inhumation. Mechanisms such as ballistic ejection, the shaking of the plant, wind, and travel in the gut of a bird, all contribute to dispersal from the parent plant. The second stage, inhumation (from the latin, humare, to cover with earth) is one in which seeds come to rest in a protective or nutritive microsite, such as an ant nest.

.....from H.Middleditch

The expression elaiosome does not appear to be used in exactly the same way by all authors when writing about appendages to seeds.

.....from R.N.Kapil, J.Bor, & F.Bouman, "Seed appendages in angiosperms" Bot. Jahrb. Syst. 1980 No.4

[This article incorporates a review of the way in which terms for seed appendages were applied by Gaertner 1788, Planchon 1845, Baillon 1876, Pfeiffer 1891, Sernander 1906, Pijl 1955, 1957, 1969, and Corner 1949, 1976] ... Corner prefers to use aril as a general term for "the pulpy structure which .... invests some or part of the whole seed". Other recent authors - Heel 1967, Puri 1970, Endress 1973, Mohana Rao 1975, follow a similar view. Finally Bresinsky 1963 follows Baillon's descriptive system, replacing the term aril by elaiosome. It was Sernander who introduced the general ecological term "elaiosome" for all the fleshy and edible parts of the diaspore.

From this glance at the literature it becomes clear that virtually every writer, while criticizing and emending the views of his predecessors, gave his personal morphological interpretation of the existing terms, or proposed a new terminology and theory.

.....from H.Middleditch

There are some excellent SEM photographs accompanying this work by Kapil, Bor and Bouman, which display a selection of seeds with appendages. These support and amplify the work of Corner. One such attachment, conspicuous in relation to the size of the seed proper, is observed to "function as an elaiosome". Although the authors are not crystal clear on the point, it appears that this particular appendage may be an elaborated portion of the funicle and not an outgrowth of the seed coat.

In "Seed Dispersal Syndromes" 1986, edited by D.Murray, it is observed by H.Howe that "an aril is an edible outgrowth of the seed coat modified for the attraction of dispersal agents"; it is also acknowledged by Howe that in this work he uses the term aril "loosely". It is further acknowledged by O'Dowd & Gill [Ibid] that the diaspore i.e. the dispersal unit of seed plus appendage, is composed of "mature seed plus an expanded and elaborated portion of the funicle". They describe this appendage as an aril but recognise that it may not necessarily be so described by other authors. But, "its important function ... is its role as a food which induces the dispersal of seeds by animals". They illustrate twelve different species of Australian Acacia seeds with appendages ranging in size from one larger than that of the seed to which it is attached, to an appendage barely one quarter of the size of the attached seed.

They consider four further species of Acacia under the heading of non-arillate seed, which presumably means a seed lacking an edible outgrowth possibly intended to attract dispersal agents. On two of these four sorts of seed, a simple remnant of the funicle is retained. On the other two, "small fragments of the funicle sometimes remain attached to the seed". The authors do not regard such seed as specifically directed towards ant dispersal.

.....from T.J.Thompson "Elaiosomes .... and ant-dispersed seeds" The American Naturalist Vol.117, 1981

Seeds with elaiosomes, lipid-filled structures attached to the seedcoat, are carried back to the nest by ants, the elaiosomes are eaten, and the seeds are discarded intact.

.....from A.J.Beattie, Evolutionary Ecology of ant-plant mutualisms, 1985

It has been found that the seeds of Calathea in southern Mexico were taken, in large part, by ants known previously only as carnivores. In response to doubts that such obvious carnivores could disperse seeds, Horvitz (1981) showed through meticulous observation that these aggressive predators carry seed back to the nest, feed the aril to the young, and bury the seed in the waste dump.

.....From Y.Gutterman, Seed germination in desert plants, 1993

Nests of harvester ants are a primary habitat for a few ruderal plants such as Silyburn marianum in Israel. The achenes have an oily food body which attracts ants. These collect the achenes and bring them to their nests. The oily bodies are removed and the intact achenes carried to the refuse zone of the nest where they germinate. The plants that grow there are larger, and each produces 3 to 4 times more heads.

Gymnarrhea micrantha is an annual in which the involucral bracts of the aerial capitula open after wetting and the

achenes, with their large pappus, are dispersed by wind. In this species all achenes of the aerial inflorescences are released when rain falls; when not carried away by the wind after release, a large % are harvested, particularly by Messor ebeninus and M.arenarius. It is interesting to note that the activity of the ants increases a few hours after rain, so that they can collect the seed of ombrohydrochoric plants [plants whose seed is released by rain] which are still free on the soil surface.

In summer, when food is short, harvesting ants separate the dry woody axis of Plantago coronopus and carry the whole inflorescence, containing seeds, to their nest.

.....from R.Bregman

When I was in Peru, in 1982, I found a population of Matucana aureiflora with a large number of ants nests between the plants. Some plants even seemed to grow on top of a nest. I now regret that I did not conduct some experiments there and that I did not determine the ant species. Certain seeds of the Borzicactinae could be dispersed by ants, as they display evidence of an elaiosome, which is specifically designed to attract ants by providing them with a source of nourishment. This feature also appears on certain Copiapoa seeds.

.....from H.Middleditch

My understanding of an elaiosome is that it it is "an appendage to the seed which, when rich in fat and protein, is sought by ants" - Strasburger, Textbook of Botany. There are some excellent sketches of seeds which display all sorts and shapes of appendages, covering a wide range of flora, in F.Corner, The Seeds of Dicotyledons 1976. All these appendages in their diverse forms, appear to be regarded by Corner as arils, rather than as arillodes, caruncles, or strophioles, but he does refer to at least one appendage as an elaiosome. Some of the appendages are quite large and some are fairly small. Looking at the slides of Copiapoa seed taken by F. Fuschillo, I see no appendage whatsoever, never mind an appendage approaching the smallest of those treated by Corner. As far as I am aware, there are no Copiapoa seed which display an elaiosome.

.....from R.Mottram.

In the sense that an elaiosome is an oil-rich attachment to the seed, formed from the funicular remains, then Copiapoa cinerea does possess this. Last year, in October, I removed a dehiscent fruit from an imported plant of Copiapoa cinerea; this was shortly after the fruit had split open, the walls of the fruit still being quite turgid. The funicles were very thin and weak, easily detached from the wall, expanding into a soft translucent white sheath enclosing the lowermost third of the seed, drying to form a loose orange brown arillus layer on exposure to air. In August of last year a fruit was removed from an imported plant of Copiapoa eremophila; the flower remains had not long broken away from the top of the fruit, which was still attached to the plant at that stage, but pulled away fairly easily. Again, the walls of the fruit were still turgid. The seeds were held by translucent whitish expanded funicles, loosely attached to the wall by a very thin thread, but here partially or even wholly enclosing each seed. The Copiapoa diaspores, i.e. seed plus elaiosome, are collected by ants as soon as the fruit opens, as has been observed by R.Ferryman in habitat in Chile.

.....from R.Ferryman

On a number of occasions I have recorded ants collecting seed from Copiapoa, in the field. The first time I recall seeing this was at Taltal where the fruit contents of C.cinerea were being cleaned out by several ants. I have seen most species of Copiapoa in flower, but fruit is most difficult to find. I am convinced that Copiapoa flower - and therefore also set fruit - over a very long period, perhaps throughout the whole of the year. The flowering characteristics of Copiapoa indicate this is most likely since they rarely exhibit more than a few flowers even on the enormous mounds of C.carrizalensis. This species, and several others, have been in flower during every visit I have made, ranging from September to March. Always the plant offers a flower, or maybe 5 or 6, from a hundred heads and more. Finished flowers are witnessed but rarely fruit.

Perhaps the best experience to relate happened at Totoral where a fruit was found that had not split. In attempting to section this fruit I obviously raised the ant alarm for within seconds the plant was covered with ants. Similarly at Taltal, extracting seed from ripe but incomplete fruit was quite a battle to beat the ants - they surely took more than my tweezers could manage. I am quite convinced that the larger mounds of Copiapoa enjoy their own ant colony and any movement of flower or fruit parts triggers their reaction.

.....from W.Krahn

During the course of my visit to Chile in December of 1993 we found fruit on many Copiapoa. In most of the ripe Copiapoa fruits I have seen some ants. These were always a very tiny sort of black ant. When the fruit is first set it is hidden in the wool which covers the growing point of the plant. During the process of ripening, the fruit become bigger and the little lid on top of the fruit lifts open and the ants can then get inside. According to my observations, the ants eat the funiculus or pulp. The ants are not interested in carrying the seeds out of the fruit, except for the uppermost seeds, and those only to make space to get further down inside the fruit. When I held in my hands fruit which was partially full of seeds that had been cleaned by the ants, the wind blew into the fruit and took the seeds away.

We saw a much larger sort of ant visiting the flowers of Eulychnia.

.....from F.Vandenbroeck

When travelling through eastern Brazil we saw a great many fruits on Melocactus, very shiny and colourful. I do not believe that the fruits last long in that condition in the burning sun. Many are eaten by birds or ants. Several specimens of Melocactus showed tunnels leading from the ground up between the ribs to the cephalium. These tunnels are made of very brittle organic material and are supposedly constructed by the ants that use the tunnels as their fixed pathways to get the seed out of the fruit. As a matter of fact we never actually saw ants taking away any seed. However, as the tunnels lead straight up to the Cephalia the ants must have been attracted by something there, which can only be the fruits, be it the juicy fruit flesh or the seeds. In either case the ants must contribute to the spreading of the seeds which I believe is the most important aspect.

.....from P.Down

But near Culpina I noted that the ants were eating the petals on the flowers of a Trichocereus macrogonus.

.....from "Cacti of Eastern Brazil" by D.Zappi & N.Taylor; Plante Grasse XIII.4;1993

[Inland from the coast] ...as the relief changes into mountains, the landscape is quickly replaced by the most luxuriant forest ... unfortunately up to 90% has already been destroyed. Less accessible than the forest are the gneissic outcrops which occur in the same region, and these are notable for the abundance of rock-clinging species of Coleocephalocereus, such a C.fluminensis, C.pluricostatus and C.buxbaumianus .... which produce bright red fruits for the ants to distribute seed over the rocks.

The edges of the caatinga are frequently marked by raised arenite or crystalline mountain ranges. The crystalline plateaux of central Brazil are dominated by savanna vegetation subject to periodical fires, called Cerrado. Species such as Cereus mirabella and Cipocereus crassisepetalus are specialised with tuberous roots .... or low growing disciform species

such as Discocactus. The other species found in this region are rupicolus, such as Pilosocereus machrisii and P.aureispinus. It is worth noting that many cerrado species may be specialised for ant dispersal of their seeds, which present very ornamented testa cells with coarse cuticular folds.

.....from M.Smith

I have been able to collect seed from a number of cacti in the West Indies, including some Pilosocereus. The only fruits that I would consider worth collecting from Pilosocereus are ripe red fruit, or nearly fully red fruit, as only then will the seed be ripe. This is not as easy as it sounds, as the fruits are quickly emptied by dispersal agents. This may well be ants as I have had problems with ants stealing my drying seeds of Pilosocerus royenii on the occasions when I have been camping and have only the ground under my flysheet to spread out the drying papers. Due to the speed of dispersal it is rare to find ripe untouched fruits.

.....from F.Ritter, 40 Years' Adventuring

On 8th April 1958 on the return journey from Palos Blancos into the mountains to the west, I came to Tacuarandi, which consisted of only a few huts, so late at night that the indians living there were already asleep. So I had to sleep out of doors and it was awkward to find a suitable place in the dark. To cap it all it was still raining, but not so heavily as to make rest impossible, although I had very little sleep. In the morning I had to remove all the spiny bits and pieces from my cover and clothing. Much worse, however, were the thousands of ants which had crawled into my sack of cacti, attracted by the juicy sap of some split cactus fruits from which the seed had not yet been washed. There was no alternative but to remove all the cacti from the sack and open each paper packet to pick off the ants. This occupied a couple of hours.

.....from J.R.Kirtley

In the Rio La Paz valley we found an Oreocereus carrying a fruit (B/K67). There was a hole in the fruit and an ant appeared out of the hole. We watched the ants on this fruit quite closely and even though there is no positive evidence of ants removing seeds, the fact that the fruit was empty and ants were seen entering and leaving the hole, convinced me that these were the insects that had emptied the fruit of seed.

.....from R.Mottram

Some years ago was the only instance I have seen of British ants - the red variety in this case - taking an interest in cactus fruits, when I watched them removing the contents of two fruits of Gymnocalycium uruguayense. In both cases the fruit split in late afternoon, and the ants appeared immediately and carried each portion of pulp and seeds away in their jaws, several yards to the nest site. Usually the fragments consisted of the seed plus the firmly attached piece of still moist funicle, but they seemed intent to take the entire contents, however it was constituted. By dawn, the fruits were just an empty shell.

One of these fruits was on Schlosser 101, which in my case had pink coloured funicles, and under the theory of O'Dowd & Gill, this would place it in the bird dispersal syndrome for Acacia. However, they do make it clear that syndromes are not exclusive of other dispersal agents.

.....from R.Bregman

I myself have also observed ants taking seeds of Notocactus tabularis from plants in cultivation.

.....from H.Middleditch

All the foregoing habitat observations would suggest that ants often remove from cacti seed to which they are attracted by the fleshy funiculus. Most seeds have an abcision layer between this fleshy funiculus and the seed proper which (like autumn leaves) only functions when the funiculus has shrivelled. Thus it appears that ants may disperse seeds either on account of the funiculus which is fleshy when the fruit first splits open, or on account of an elaiosome which is really a part of the seed. So will cacti whose fruit and seed displays neither of these features fail to attract ants for seed dispersal?

.....from Brown, Grover, Davison, & Lieberman "... Seed Predation in ... Desert habitats" Ecology 1975 Vol.56.

The authors placed samples of various seeds out in the desert. It was found that ants would collect grains of barley, rice, millett, and even peas, none of which exhibits any shape or form of an elaiosome. Of the seeds collected by the ants the authors say that "the preferred sorts have rough, textured surfaces, in contrast to the smooth, hard surfaces of other spp. The ants may simply find the textured seed easier to grasp and transport ... ". In this way the authors demonstrate that seeds do not need to possess an elaiosome before they will be carried away by ants.

.....from F.E.Weiss "The dispersal of fruit and seeds by ants" 1908

There remains one point to be noted with regard to the dispersal of plants by ants and that is the fact that some species of ants such as Aphenogaster barbara and Aphenogaster structor collect and carry away indiscriminately all seeds that are not beyond their powers of transportation. They do not confine themselves to those which have elaiosomes, but take away to their nests other fruits, such as those of Anthoxanthum odoratum, Festuca ovina, Betula alba, and Anemone nemorosa.

.....from P.Muller-Schneider, Beitrage zur Kenntnis der Samenverbreitung durch Ameisen, Schweiz Bot. Ges. Vol.80 1971

Bresinsky wrote in 1963 that "Plants which do indeed possess an elaiosome-like appendage, like Colchicum autumnale and Luzula campestris, but are not distributed by ants, display not a trace of Ricinolic acid [in the appendage]". The study of the collecting activities of the ants Lasius emerginatus showed that, among many other sorts of seed, they did collect those of Colchicum autumnale and transport them to their nest. Two observations were also made, at different sites, of seeds of Colchicum autumnale being transported by Formica rufa.

.....from R.Bregman

Ant-dispersed seeds do not necessarily have to possess an elaiosome. In some genera of the Lilly family, such as Scilla, Muscari, Ornithogalum and others, the seeds are dispersed by ants but they do not have elaiosomes. Instead, the upper cell layer of the testa contains the ant-attractant substances.

.....from H.Middleditch

Has anyone actually carried out an analysis of the components of a supposed elaiosome in order to establish whether any ant-attractant components are to be found therein?

.....from R.Bregman

You may find that the paper by A.Bresinsky in Bibliotecha Botanica for 1963, entitled "Bau, Entwicklungsgeschichte und Inhaltsstoffe der Elaiosome", does provide more positive information regarding the existence of ant-attracting components in the appendages of various seeds.

.....from H.Middleditch

The paper by A.Bresinsky does indeed contain some analytical data regarding the presence of ant-attractant

components in the appendages of a fairly large selection of seeds. The majority of the appendages illustrated by Bresinsky would probably be classed as an “elaiosome” by many of the other authors writing on this subject; but the seed of Adonis vernalis is shown entirely surrounded by a fairly thick coating. This would commonly be described as an aril by some other authors. Hence, as noted by Kapil, Bor, & Bouman 1980, Bresinsky appears to include any sort of seed appendage within his application of the term elaiosome.

Those seed attachments in which fats, sugars, and other ant-attractive elements have been found are tabulated by Bresinsky for forty one species. Also tabulated is the existence of glucose, fructose, and saccharose as components of the sugar in the seed attachments of thirty species, together with their concentrations in respect of eight species. There are thirteen pages of sketches of seed appendages, most of these being cross sections to demonstrate the connection between seed and appendage; on the majority of these sketches the disposition of the ant-attractant cell contents is identified.

There is a sketch of the seed of eighteen different spp. of Viola arranged in decreasing size of appendage. The largest appendage, that of Viola odorata, is 2/3 the size of the seed, while the smallest appendage, that of Viola biflora, is only 1/7 the size of the seed. These eighteen species of Viola (together with five additional spp.) are divided into four groups. The nine spp. in the group with the proportionately largest appendage do not possess an explosive capsule for distributing the seed. Those species in the other groups, with a proportionately smaller appendage, do possess an explosive capsule for distributing the seed; of these, twelve spp with the next-largest appendage are classed as ant-dispersed but not exclusively so. The tables of ant-attractant components include Viola spp. from both of these groups. No analytical evidence is provided to demonstrate the presence or absence of ant-attractant components in the seed appendages of relatively minor size, which are nevertheless stated categorically not to be ant-dispersed.

It is not made clear by Bresinsky whether this attribution to ant-dispersal or non-ant dispersal has been established by observations in the field. What is clearly lacking is analytical determination of the presence or absence of supposedly ant-attractant components in seed coats or appendages of seeds which can be shown by field observation not to be ant-dispersed.

.....from A.J.Beattie, Evolutionary ecology of ant-plant mutualisms 1985

Bresinsky (1963) provided many insights into the nutritional rewards present in the elaiosomes of ant-dispersed species from northern and central Europe. Of the forty-one species analysed, all but three contained lipids and all but ten contained sugars. In addition, sixteen contained a significant amount of protein, nine contained starch, nineteen contained Vitamin B, and twenty contained Vitamin C. Glucose was the most common sugar (thirty spp.) and fructose (26 spp.), saccharose (10 spp.) and xylose (2 spp.) accounted for the remaining carbohydrates. Ricinoleic acid was a conspicuous component of the lipid fraction of eight spp. A variety of nutritional rewards was present in Viola odorata, which contained lipids, including ricinoleic acid. Bresinsky concluded that ricinoleic acid was the ant attractant in this species. Marshall et al. (1979) analysed the lipid fraction of the elaiosome of V.odorata in greater detail, taking advantage of a new bioassay that could be used both in the field and the lab. Exact quantities of fractions isolated from the elaiosomes were applied to porous teflon cubes of about the same size, weight, and handling characteristics as the real violet diaspore. The cubes, being inert, permitted the bioassay of materials without contaminants, whilst their weight and texture permitted easy manipulation by the ants. As the human experimenters also handled them easily, precise tests could be carried out in both the field and lab.

During the preliminary experiments, the lipid fraction of the elaiosomes was clearly shown to be the most attractive to Aphenogaster both in the field and in the lab, and the non-polar lipids were unequivocally more attractive than polar lipids. Gas-liquid chromatography revealed the presence of many fatty acids; hence linoleic, stearic, palmitic, palmitoleic, nervonic, elaidic, vaccenic, lignoceric, myristic, behenic, 12-hydroxistearic, hydroxipalmitic, and ricinoleic acids were all bioassayed. Although ricinoleic, among other fatty acids, elicited some response from ants, it was not nearly so attractive as the diglyceride fraction. As the chromatography had revealed a large peak corresponding to oleic acid, it was possible that 1:2-diolein was the diglyceride attractant. In a final series of bioassays it was shown that 1:2-diolein was far more attractive than 1:3- diolein, monolein, oleic acid, and ricinoleic acid. Thus, contrary to Bresinsky’s (1963) result, ricinoleic acid was neither a major fraction of V.odorata elaiosomes, nor did it elicit a strong response from ants. By contrast, diglyceride fractions and standards elicited the strongest response, in particular carrying behaviour, which led to the removal of test cubes from the experimental area - the behaviour most relevant to seed dispersal.

.....from H.Middleditch

In summary, it appears that seeds of certain plants do have an outgrowth from the seed coat which is rich in fats or oils, described by some authors as an elaiosome. In addition there are certain seeds to which remains attached an elaborated portion of the funicle which is pretty conspicuous in relation to the size of the seed, and such attachments evidently function as elaiosomes. Not all of those authors who are concerned with either seed morphology or with seed dispersal, term an elaborated portion of the funicle as an elaiosome, but ecologically it appears to perform the same function. There are also seeds to which a complete, partial, or fragmented membrane is attached, which (in the case of Australian Acacias) O’Dowd & Gill do not consider to be directed towards dispersal by ants, but which Brown, Grover et al suggest can be dispersed by ants.

Evidently there are a number of species whose seeds possess an external coating of material which is like an elaiosome in that it contains ant-attractant materials, and which is equally effective in inducing the ants to disperse the seed. It is open to question whether the thin membraneous coating, not always complete, which may be seen on the exterior of many sorts of cactus seed, represents the remains of a coating rich in ant-attractant material. In addition, where the ripe seed retains a fleshy funicle, it appears that ants visit the fruit to consume the funicle and displace seed off the plant in the process, or even transport the seed back to the nest for the nourishment value of the funicle alone.

There are also a number of ants which can be classed as omnivores i.e. they will eat anything edible that they come across. A number of authors have also observed ants transporting seed which appears to be entirely lacking in any form of edible ant attractant. That said, the weight of evidence available would support the theory that most seed transportation by ants is motivated by the presence of some form of ant attractant on the seed proper or on the attached portion of the funicle. As with seed dispersal by other fauna, most collected seed is consumed as nourishment and it is that small proportion of seed which is dropped or discarded undamaged which provides effective seed dispersal for the plant.

If an elaiosome is to be regarded as an appendage to a seed, rich in fats and oils, attractive to ants, bringing about consistent dispersal of the seed by ants, then both an analysis of the contents of the appendage and field observations of the mode of seed dispersal are required in order to substantiate those statements in the literature which appear to be largely of an academic nature.

.....from R.Bregman

For the future I have plans for detecting possible chemical attractants in the seed appendages or funicles in Rebutia,

Notocactus, and some other genera that I can get enough seed from.
.....from A.J.Beattie, "Distribution of ant-dispersed plants". Sonderband Naturwissenschaft Verein Hamburg, Vol.7 1983
Some genera which contain myrmecochorus spp: Cactaceae. Blossfeldia, Frailea, Setiechinopsis.
.....from H.Middleditch
Where did he get that idea from? And why not Gymnocalycium, Pilosocereus, or Matucana?

ECHINOPSIS CHRYSANTHA By E.Werdermann
Translated by H.Middleditch from Notizblattern der Bot. Gart. und Mus. Berlin-Dahlem Vol.11 No.104, 1931.

Body depressed globular ca. 6-7 cm broad, 4.5 cm tall, the crown somewhat depressed, spineless and with only a little wool-felt on the round areoles. Body colour matt grey-green, with minute dots. Ribs ca. 13, narrow and ca. 6-7 mm tall at the crown, becoming broader and flatter below. Areoles about 1.5 cm apart, sunken, roundish, ca. 3 mm in diameter, covered with some greyish-white wool when young, later becoming bare. Spines all radial, 5-7, rarely more (in the new growth 3-5, with blackish tip, reddish at the base) dark brown with a greyish white coating, later a dirty grey, spreading, but usually not curved back to the body, but somewhat outstanding, round in cross-section or only slightly flattened, almost entirely straight, thin awl-shape, stiff, sharp, at the base swollen somewhat onion-like and usually darker. The uppermost pair often absent or commonly the weakest and shortest.

Flowers singly from areoles at the side of the body but fairly near to the crown, in total about 5cm long. Pericarpel globular, ca. 5 mm in internal diameter, dark green exterior, with numerous olive greenish-brown scales in whose axils arise grey-white woolly hairs up to 5 mm long. Tube about 2.5 cm long, broad funneliform, exterior olive green, scales oblong-lanceolate, up to 1 cm long and 4 mm broad, with numerous white and dark brown woolly hairs up to 10 mm long, pointed, margin entire, often somewhat cuticular at the margin, olive green at the base, more brownish towards the tip. Outer petals somewhat shorter than the inner, yellow with darker middle stripe that is more greenish below and more brownish above. fairly broad, pointed and clearly denticulate on the upper margin. Inner petals ca. 2 cm [?long-H.M.], oblong, up to 12 mm broad, rounded at the end and especially there clearly denticulate, glossy golden yellow or somewhat orange yellow. Stamens inserted in two separate series, the inner at the base of the tube standing round the style. Filaments of the inner series deep purple in their lower length, turning gradually to yellow above. Filaments of the upper series orange yellow, becoming free at the top edge of the tube. Throat greenish, dark purple at the base. Style ca. 16-17 mm long, deep purple colour. Stigma lobes spreading ray-like, 9, ca. 5 mm long, purple coloured. Style and stigma lobes hidden well down in the flower, projecting only slightly above the shortest stamens. Fruit and seed unknown. Habitat unknown (Prov. Los Andes?).

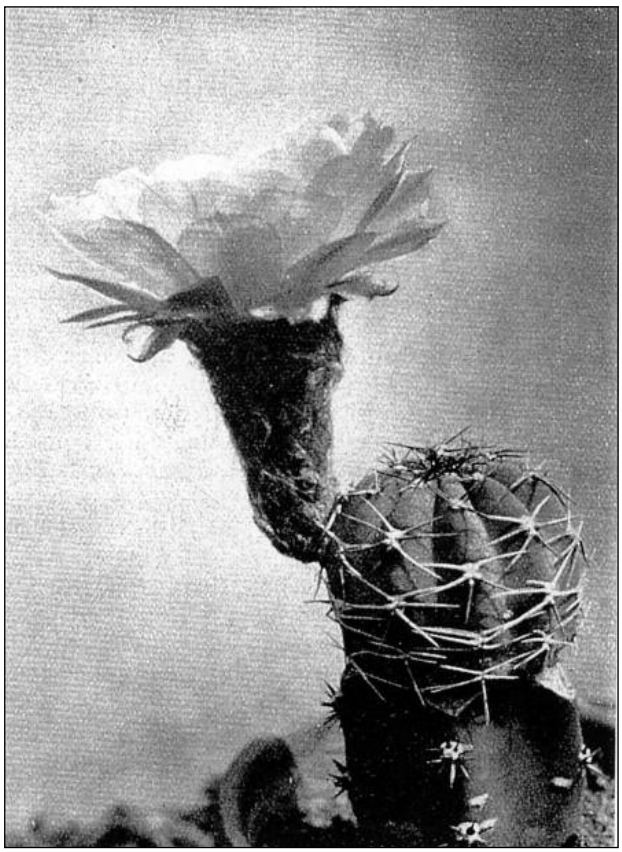
Echinopsis chrysantha is related to Echinopsis aurea Br. & Rose, and stands very close to the Echinopsis hossei Br. & Rose whose description follows. The plants designated by Fric by the catalogue name Lobivia staffeni ought to be identical with the above description.

.....from H.Middleditch
There is a slip of the pen by Werdermann here as it should have been E.hossei Werd sp.nov., not E.hossei Br. & Rose.
.....from M.Lowry
In 1990 I was able to pay a visit to the herbarium at the New York Botanical Gardens and examine a number of the cactus specimens preserved there. Among those which I was able to examine was a sample of Lobivia chrysantha, The accompanying note stated that this had been collected at Puerta Tastil, Salta, Argentina, at 3000 m altitude by S.Venturi (No.8207) in 1929.
.....from H.Middleditch
From Fric's own account of his travels in north-west Argentina, [Chileans' 15.50 pp 80-82; Chileans 15.51 p.105] it is clear that Venturi was not able to accompany Fric when he went from Tucuman to the Quebrada del Toro, in the January of 1929. It also appears from Fric's own account that he had been in touch with Venturi prior to their meeting in late 1928, from which one might assume that the two were on reasonably good terms. It hence appears quite probable that Fric would acquaint Venturi, even if only in general outline, with the outcome of his visit to the Quebrada del Toro. For his return trip to Buenos Aires from Salta, Fric would probably travel in the same manner as on his outward journey i.e. by rail; the most commonly used railway line from Salta to Buenos Aires would take him via Tucuman where he could break his journey to see Venturi. Whether Fric saw Venturi on his return from Salta, or wrote to him, it appears that Venturi could have decided to visit the Quebrada del Toro not long after Fric's return to Europe. At that point in time the railway line would not have extended much beyond Santa Rosa de Tastil so that any hiking undertaken by Venturi probably covered ground already traversed by Fric. However, the herbarium specimen seen by M.Lowry comprised both plant and flowers. In view of the synchronised flowering time observed by Fric (yellow flowers looking like a field of dandelions) it is somewhat surprising that Venturi was able to procure a plant in flower when his visit to the Quebrada del Toro must have been two or three weeks after that made by Fric..

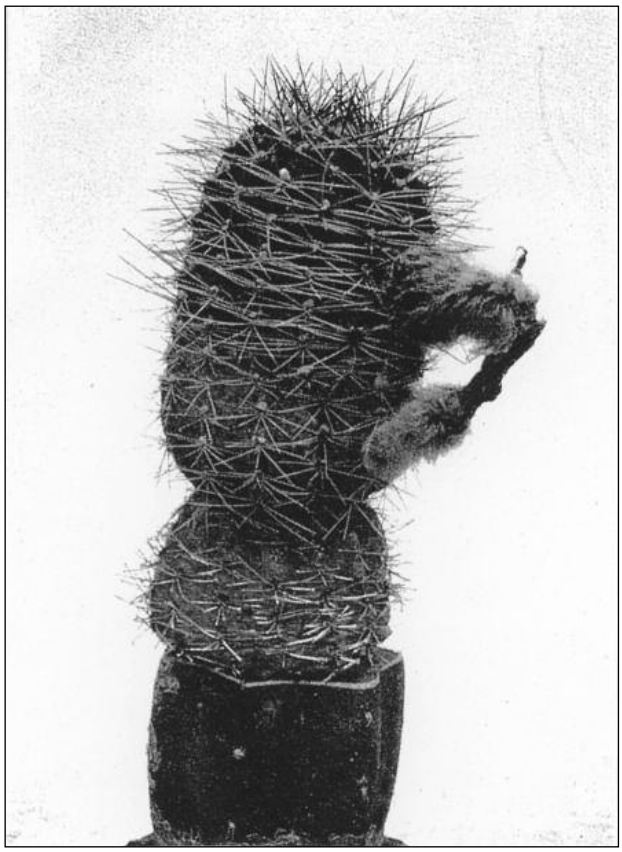
ECHINOPSIS HOSSEI By E.Werdermann
Translated by H.Middleditch from Notizblattern der Bot. Gart. und Mus. Berlin-Dahlem Vol.11 No.104 1931

Body solitary or branched from the base, elongated globular or short cylindrical, somewhat tapering above and below, somewhat depressed in the crown, covered over by spines, almost ca. 15 cm tall and 7-8 cm diameter at the broadest part of the upper half, spineless and very corky in the lower half. Body colour dull matt grey-green or infused with brownish red. Ribs ca. 16, fairly narrow, separated by sharp longitudinal furrows, perpendicular or slightly spiralling upwards, becoming flatter below, somewhat curved outward between areoles, without cross-grooves. Areoles 12-14 mm apart, roundish, ca. 2-3 mm in diameter, slightly white woolly when young, later bare. Radial spines usually 7-8, up to 2 cm long, projecting horizontally in a rather irregular manner, the two uppermost the longest. Central spine 1-3, rarely absent, porrect, close to the crown often found inclined upwards, up to 3 cm long. All spines strongly needle-like to thin awl-like, very stiff, straight or only slightly curved, rough, round in cross-section, blackish brown in new growth, later becoming grey with darker tip. at the base grubby greyish yellow and swollen to an onion shape.

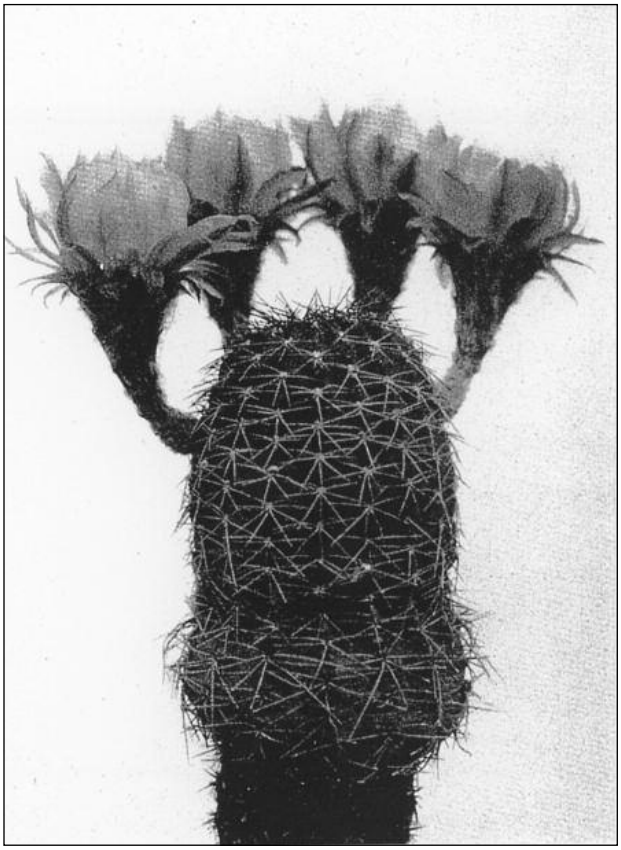
Flower ca. 6 cm long, almost upright, remaining more or less closed bell-shape, from the upper part of the body.



Lobivia chrysantha



Lobivia chrysantha v. leucantha



Lobivia chrysantha v. janseniana

Beitrage zur Sukkulenten und Pflege 1942

Ovary elongated egg-shaped, 6 to 8 mm in diameter. Pericarpel and tube clearly fluted, with numerous scales, 2 mm long below becoming 10 mm long above and 7 mm broad, long pointed tip and greenish with red-brown tinge just like the tube. From their axils arise numerous pale grey to dark brown woolly hairs of a length of up to 10 mm. Outer petals with plain margin, reddish brown with darker central stripe, oblong, 12-15 mm long, 6-8 mm broad, with distinct pointed tip. Inner petals ca. 2 cm long, narrowing towards the base, broadly blunt at the tip, ca. 16-17 mm broad, plain margin at the sides, clearly and irregularly denticulate at the upper end, with a pointed tip, deep golden yellow to orange colour. Throat purple in colour. Style columnar, pale olive green, ca. 2 cm long inclusive of the 10-12 violet purple ca. 8 mm long stigma lobes. Stamens inserted in two series, the inner series deep violet purple becoming paler towards the end, the outer stamens adnate to the tube, pale yellow, Anthers yellow. Seed strings branching from the base. Fruit and seed unknown.

This species is named after Prof. Hosseus who sent the plants pictured here in the year 1929 as a single specimen to the Dahlem Botanic Garden. The plant cultivated on its own roots produced a single flower in 1930, three this year, which only opened to a bell shape and the petals did not reflex. This year Stuemer sent a number of imported plants from Argentina which the natives there call acha-cana. These have not flowered for us yet, but they appear to me to be identical with the foregoing species. These plants are usually branched from the base, and customarily have more than one central spine and 11-13 radial spines.

This species stands in very close relationship to the E.chrysantha Werd. newly described above. The latter has fewer radial spines and no central spine, diverging also in some features of the flower, particularly in opening wide.

.....from H.Middleditch

One cannot help but speculate that since Venturi was in the habit of sending specimen plants to Spegazzini, that one result of the 1929 visit to the Quebrada del Toro by Venturi was the sending of a specimen plant or plants to Hosseus, one of which was forwarded to Berlin Dahlem Botanic Garden, there to be named L.hossei. To judge by the description of the lower half of the body as very corky and spineless, it may be surmised that this plant had been partially buried below the surface level of the ground in its habitat location, as appears to be typical for these plants.

LOBIVIA CHRYSANTHA Werd. By W. Wessner
Translated by H.Middleditch from Beitrage zur Sukkulentenkunde und -pflege. No.2 1942

This fine plant is a name not often met with in our collections. There are often Lobivia with similar flowers but with entirely different bodies. In reality the characteristic plant is always still very rare. Three living specimens were sent to the firm of Hahn in Berlin by E.Stuemer in 1930. Werdermann thereafter described it as Echinopsis chrysantha Werd. A short while later (15 October 1931) he pictured it in colour on Plate 18 of his Bluhende Kakteen with a more detailed description. A further illustration from him appeared in Gartenflora 1931. Since this literature is not convenient of access for most cactophiles, I ought to bring this species to the notice of the reader in word and picture. I was able to look at many imported plants from Blossfeld-Marsoner in 1936, which however more or less deviate from the Type. The plant pictured here originates from Hahn and corresponds in all its features with the original description.

[Detailed description follows]

As to relationships, Lobivia janseniana Bckbg stands very near - if both are not identical? At the same time as he described L. chrysantha, Werdermann also described his L.hossei and L.marsoneri. However flowers and spination distinguish them from L.chrysantha. They all belong in a species complex, perhaps also with L.hardeniana. My numerous imported examples show that we have here a very wide range of variation within a species complex. The difference lies in the spination; plants occur with only radial spines and others with both radial and central spines, greyish white to deep black, thin needle-like or stouter awl-like. The body can vary from deep grey to reddish brown and can display fewer or many ribs. The length of the flower can extend to 45 mm and more, up to 60 mm, the diameter up to 35 mm or as far as 70 mm and more with a wide open flower. The flower colour can be pale citron yellow, usually pale or dark golden-yellow, the throat colour is usually pale or dark purple, but I have even seen green. Likewise with the colour of the stamens, style, and hymen. It would be my intention to begin first of all to explain those species already described, one at a time. Active support with pictures and plant material from a circle of cactophiles could only further this arduous task. However, L.chrysantha is so typical that it is easily recognised and not to be mistaken for anything else. The habitat quoted by Werdermann is Argentina, province Salta, whilst in Neue Kakteen Backeberg quotes ?province Los Andes.

A further plant must be included here and considered carefully - Lobivia staffeni Fric 1928. In Kreuzinger's Revision 1935 p.34/35 it is pictured as No.598 - "orange-yellow flowers with red throat. Synonym Echinopsis chrysantha Werd. 1931". I am not able to find a description by Fric from 1928 or even later. In Kaktusar 1931 p.83, in the course of describing his collecting trip, he writes of Lobivia staffeni that it occurred in great numbers on a high plateau near to an indian cemetery; towards midday, when the flowers open, the bare arid waste looked like a meadow full of dandelions. The bodies are dark coloured, often reddish, with short, stout, spines, solitary, shrunken down into the ground between lumps of stone. Without flowers they are very difficult to find. According to statements by the natives the roots are edible. The area of distribution is spread over a 150km wide plain, at about 1000m altitude. There are several varieties. So much for this account.

Kreuzinger pictures a variety lagunilla (p.35) with pale yellow flowers with a red throat. According to the illustration it is more strongly spined (11). Here again, any description is absent. In the Vienna Gartenzeitung for April 1935 Fric provides a picture of "Andenea staffeni" which also has 9 to 11 spines. As habitat he quotes Puerta Tastil, a plateau at 2400m altitude.

I myself have unfortunately seen no reliable ex-Fric material yet. I would be very grateful to be able to refer to this; also I am not sure whether L.staffeni and L.chrysantha really are identical. In that case the above allusion in Kaktusar may not be sufficient proof. In the Vienna Gartenzeitung and also in Kreuzinger's Revision are found other pictures of Lobivia (Andenea) klusacekii, and L.dragai, etc., which must be looked at more closely later.

.....from C.Backeberg. Beitrage zur Sukkulentenkunde und -pflege No.3 1942

It will be of interest to see whether I am able to make observations on my own material of L.chrysantha. Some of these plants were received under the name L.staffeni and sent from Stuemer in Buenos Aires with a number of other specimens which are different from the Fric plants. These were described by me in B.f.K. 1936-10 as L.janseniana and v.leucacantha. The accompanying illustration was of a young plant with still fewer radial spines. Now that I have fully grown specimens up to 17 cm long I can make a survey of the whole group.

In regard to this Lobivia group, I am today of the opinion that the plants more or less resembling the first described Type Lobivia chrysantha Werd. can only be regarded as varieties of that species, since even the extremes, such as L.chrysantha and its v.leucacantha, when considered separately, could be taken to be two very different plants. But even in other species of the genus Lobivia it has indeed been shown, the more material becomes collected over there, that the range of habit can be significant, and likewise the variations in the colour and size of the flower.

From the material I am familiar with, I give a summary of the most significant characteristics of the four principal forms:-

With 5-13 ribs, ribs clearly flattened. Body colour matt grey-green to dark grey green; only radial spines 5-7, rarely more, slim awl-like, stiff, sharp, with dark brown coating, later dull grey. The spines can even be blackish initially
....,*L.chrysantha* Werd.

With 13-18 ribs, dark blue-grey body, only radial spines 7-12, thin, appressed, elastic, initially blackish-grey, then ash-grey, the lowermost the longest, up to 15 mm long ... ...*L.chrysantha v.janseniana* (Bckbg) Bckbg.

With about 16 ribs, dark blue-grey body, 1 to 3 central spines up to 3 cm long, all strong, stiff, initially brownish-pink, later grubby yellowish-grey, radial spines usually only 7-8 (there can be more)
... ...*L.chrysantha v.hossei* (Werd.) Bckbg

With 13-16 ribs, pale green body, only radial spines, 9-12 up to 2 cm long, thin, elastic, initially pale brown, then greyish white with darker tip, set somewhat away from the body and interlacing
... ...*Lobivia chrysantha v.leucacantha*(Bckbg)Bckbg

For details of the flowers an opportunity is awaited. In the Type that is to say L.chrysantha, they are very characteristic, all flowers are yellow, more or less golden yellow, the throat is pale to dark purple red, according to Wessner even occasionally green.

In particular it is still to be noted: in L.chrysantha even a central spine can occur by exception, so that the spination is arranged most inconsistently. One of the upper radial spines sometimes moves to the middle, where it then becomes longer and outstanding; this is however an exception. There are also plants of v.leucacantha with stronger, stiff, spines; with v.hossei one central spine can even stand out stronger and stiffer. With these Lobivia it is as with many other species, the number of ribs increases with age, likewise the spine count.

Doelz suggested the second revision of the group, in the course of which he indeed had already expressed the view that L.janseniana is identical with L.chrysantha, on the basis of my photographs in the B.f.K. 1936-10. Examples which have been cultivated for a good period of time differ from the Type however in the rib count and spination; in spite of that it appears to me inevitable that all the above forms be brought together under a single species.

Lobivia hossei should, according to the author, be distinguished from L.chrysantha on account of its different spination, but as mentioned above, there is little difference between the flowers of the group. In his publication of L.hossei, Werdermann says that the flower only opens bell-shaped, the petals do not bend back. This I have observed with yet other forms; it is no doubt attributable to weather conditions. In the full glare of the sun the petals can open further.

In the foregoing publication, Werdermann then spoke about L.hossei which Stuemer had brought along to him in 1931 as imported plants, and which had had 11 to 13 radial spines as well as usually more than one central spine. Nothing was said about the colour of the bodies and spines. I do not know of any observations that have been made later concerning these plants. Possibly I also possess a specimen of the v.hossei which carries 16 radial spines. The one central spine is usually stiffer and more outstanding.

Accordingly the description of v.hossei is to be conceived in a rather broader fashion, and that also goes for the other varieties as well as for the Type. With this group no precise rib count or spine count can be laid down. But the above review gives a suitable reference basis for for clear separation of the principal forms. As is often the case, transitions may occur, perhaps on account of cross-pollination in habitat. For the time being perhaps it will only be possible to define the above Type and the three more obviously different varieties. When Werdermann made his publication in 1931, the group was not so well known as it is today, and consequently L.hossei could have been regarded at that time as an individual species, just as I likewise described L.janseniana at a later date.

Of Fric's imports here, there are still some further names, which Wessner has reviewed. However, I do have plants which came to me from Czecho-slovakia under the names L.staffeni and v.lagunilla, which are identical with L.chrysantha and v.leucacantha. Whether they originate from Fric, I would not know, but it is quite probable. Just as little can I say as to whether L.klusacekii and L.dragai belong here. Also L.kuehnrichii should be one form of this group, as Doelz indicated to me, since the name is undescribed and invalid, as Werdermann has already indicated, it being a catalogue name according to him. Probably this also falls in with the rest.

After the above review and the classification of these varieties under the Type L.chrysantha, the Fric names appear to be meaningless. Nevertheless it would be very welcome if Wessner could establish to which of the above forms they belong, lest the corresponding (invalid) n.n. pass away from many collections.

As confirmation of my view that all the above forms are only one single species, it may still be said that the specimens of v.leucacantha found earlier among the Stuemer harvested consignment, also included plants with blue-green and pale green bodies, with blackish-grey and pale-coloured spines. As Marsoner would be aware of from where the Stuemer-delivered plants originated, it is assumed that the well-known specimens from Blossfeld-Marsoner referred to by Wessner in his article (above) were extracted from the same location.

.....from H.Middleditch

Both Backeberg and Wessner mention several Fric names for plants which they suggest could be synonymous with L,chrysantha. Fortunately the Gartenzeitung der Osterreichischen Gartenbau Gesellschaft in Wien 1935 No.4 which carries the account of Fric's trip to the Quebrada del Toro, includes photographs of three of these plants viz: Andenea staffeni, Andenea klusacekii, and Andenea dragai. The issue of Succulenta which also carried this same account included a couple of different photographs viz: L.janseniana (L.staffeni) and L.janseniana v.leucacantha (L.staffeni v.lagunilla). The illustration of L.janseniana in both the Vienna Garden Club Journal and in Succulenta show a plant with shallow rounded ribs barely cross-notched (if at all), with areoles well apart from each other, with short thin radial spines, curving round the body and barely overlapping those from the adjacent areoles (except near the crown) together with what may be a single (but not long or robust) black central. Possibly on account of the areoles being a fair distance apart, the overall impression is of a great deal of exposed body and sparse spination. This is somewhat similar to one of my own imported plants of L.chrysantha received from J.Hopkins.

The other photographs are all of plants with areoles at a much closer pitch, with slender spines where the centrals are not at first glance readily to be distinguished from the radials, spines standing away from the body to a greater or

lesser degree and looking somewhat similar to the illustration of L.chrysantha v.janseniana in Beitrage zur Sukkulentenkunde und pflege No.3 for 1942. There would appear to be reasonable grounds for the generally held view that these Fric names cannot be separated from vvs.hossei, janseniana, and leucacantha.

LOBIVIA CHRYSANTHA V.HYPOCYRTA Rausch sp.nov.
Translated by H.Middleditch from K.u.a.S. 11.23:1972

Simple, depressed globular, up to 20 cm tall and 50 cm in diameter, entirely hidden in the ground, with a long thin rootstock, grey-green to violet-brown; ribs 10-13, vertical, rounded. Radial spines usually 8, awl-like with thickened foot, lying close to the body and often slightly bent, 3-8 mm long, yellow to black; central spines 1-4, disposed in a cross, 3-5 mm long, robust awl-like with thickened foot and the top curved slightly upwards, black. Flower, fruit, and seed as the type.

Habitat. Argentina, Salta, near Cachinal at 4000m altitude. Type Rausch 161 in the Vienna herbarium.

In various localities I am able to recognise three form-groups of Lobivia chrysantha (Werd.) Backeberg. The type grows in Argentina, Salta, on the high plateau, with appressed spines - this has the forms v.janseniana Bckbg., v.hossei (Werd.) Bckbg., v.leucacantha Bckbg., L.staffeni Fric, and v.lagunilla Fric. More to the south in the valleys the plants have more outstanding spines, such as L.polaskiana Bckbg., L.klusacekii Fric, L.dragai Fric, and L.schuldtii Fric. West of that, the ribs become rounder, more tuberculated, and the spines somewhat curved - v.hypocyrta Rausch. In general the plants are very variable as I am able to count from 8 to 26 ribs, the flowers are simple to effectively double and pale yellow to orange. They form a thickened rootstock which can retract so far in the dry season that pockets are formed in the hard ground of the plateau. In cultivation this species group is somewhat sensitive, so that it is expedient to graft it.

.....from H.Middleditch

This commentary by Rausch appears to mirror the view expressed in 1942 by Backeberg that all these various names are to be regarded as variations within the single species of L.chrysantha. It may be as well to note that the reported area of distribution occupied by these plants is confined to the Quebrada del Toro. The lowest altitude at which they are to found is at about 2500m, near Ing.Maury, as reported by K.Preston-Mafham [Chileans No.51 p.116], and [below] by M.Nilsson, from where they extend for perhaps 50 km or 30 miles up the valley. By comparison with the distribution area occupied by several species of Gymnocalycium or Melocactus, this area of distribution for L.chrysantha is very small indeed. It is indicated by Rausch that his v.hypocyrta occurs in the western (more accurately north-western) part of the valley, a statement supported by his habitat location of Cachinal for this variety. It may be that the increased altitude and consequential shift in climatic regime of the upper part of the valley supports the v.hypocyrta. On the other hand, it may be that a local micro-climate will generate one of the many varieties of L.chrysantha, such as the original Fric L.kuehnrichii with S-shaped central spines. But certain variations may be repeated at different places in the valley, even as far apart as at almost the highest and the lowest extremity of the area of distribution.

.....from R.Hillmann, Field Number list

RH 1304 Lobivia chrysantha v.hypocyrta Cachinal 3750m
RH 1289 Lobivia chrysantha v.hypocyrta Gobernador M.Sola 2550m

.....from M.Nilsson

The Lobivia chrysantha MN 111 was found at Cerro Golgota, Ing. Maury. Just a couple of plants were found here, which have weaker spination than the forms from Santa Rosa de Tastil or Las Cuevas. Ing. Maury lies at a lower altitude than the other two villages and the plants here look different. I use the provisional name v.klusacekii as in this way it is easier for me to separate this form in my collection list from the “type” which grows higher up the Quebrada del Toro. Plants from Las Cuevas have in general longer and stiffer spines than those from Santa Rosa de Tastil, and I think that this is Rausch’s v.hypocyrta, and should be treated as just a form of L.chrysantha. We saw a flower on one plant only at Cerro Golgota - a fantastic orange-yellow with with thin reddish stripes and a reddish throat, plus reddish anthers. Very nice!

.....from H.Middleditch

When J.Hopkins was in the process of disposing of a large part of his cactus collection, I paid him a call and found that he still had available a few nice imported plants of Lobivia. Of these, two were ex-habitat Lobivia chrysantha, which I acquired. Both plants had the shallow intercostal grooves and very blunt ribs, well spaced areoles, seven buff coloured appressed radial spines and one black central spines. In appearance they were somewhat like the plant in the photograph which accompanied the Rausch description of L.chrysantha v.hypocyrta. Both plants are short columnar, about four inches tall and an inch in diameter, with offsets from the base or from very close to the base. The lower part of the stem has evidently grown in habitat, being very corky, the spines on this part of the body being about 20 mm long; these spines are now coated with an efflorescent deposit and gradually disintegrating. At the shoulder of the plant the central spines stand almost vertical, whilst on both habitat and cultivated growth the central spines point somewhat outwards but well upwards, at no great distance from the body. Once the flower buds reached a length of about three inches the exterior of the unopened petals displayed a deep pinky peach colour with a tinge of red, so it was rather surprising to find that the open flower was a fairly deep yellow colour. The ends of the petals remained curved upwards slightly so that the open flower took on the shape of a shallow bowl. The stigma lobes were a very deep red colour, almost like leather, whilst the style was so dark red as to be not far off black. On one flower the stigma was held just below the lowermost anthers and on another flower the stigma lobes were held just above the lowermost anthers. The throat appears to be a deep red colour but when the throat ring filaments are stripped off the inner wall of the tube of a half flower, by grasping them in a bunch and pulling downwards, it transpires that it is the dark red colour of the filaments which gives the throat this colour. Without the filaments the throat is pale green. Attempts to set fruit with the aid of a brush were not successful. These two plants are dreadfully slow growing, so much so as to be almost at a standstill.

.....from R.Purslow

Lobivia chrysantha is indeed amongst the slower growing of the Lobivias. I have some small plants of L.chrysantha R5 and a few small seedlings with Lau numbers which I have on grafts. My largest L.chrysantha is a plant of B.98 ex Whitestones. This has a tap root which is about 10 cm long and from its truncated appearance it was probably even longer before the bottom was snapped off! Fortunately the spination produced in cultivation is similar to that of habitat growth. On fresh growth the central spines project but revert to lying tight against the body after a couple of season’s growth. The buds are covered by bristly hairs which go straight up the bud making it look like a paint brush. The flower is pale yellow

with a dark throat.
.....from G.Charles

I have a number of L.chrysantha DSW 9 which I raised from seed. The body is a blue-green colour; with these plants the body is the first thing to strike you because the spines are relatively short and few in number. Also the areoles are not close together. Quite a number of these plants have flowered, all with a yellow flower - more accurately, a somewhat orange yellow colour. Growth rate has been slow and some of these plants have been very slow indeed. It is possible that they may do better if grown in a mineral compost - that is, one which is very gritty - and also if they are watered rather more sparingly. These plants do indeed come from an area of NW Argentina which is very dry. Despite the fact that we stopped at one or two places in the Quebrada del Toro where these plants grow, we did not see any. It could be that we did not stop in quite the right place, but I would also suspect that the habit of these plants in growing nearly flush with the surface of the ground would make them difficult to spot.
.....from J.Arnold

Fortunately I have a number of plants of Lobivia chrysantha from various sources, many of which are of habitat origin and I have had them for some time. These plants are quite slow growing with me and the body texture is extremely hard. Although they are obviously recognisable as being able to withstand considerable drought and aridity, I must confess that I was amazed by the slides shown to us at The Chileans' Weekend by K. Preston-Mafham, of plants in habitat which were in such an extreme state of dessication that they did not even appear above ground level! These conditions must surely be very extreme for a Lobivia.

Of the imported plants, three were received from M.Verab in Argentina via Windyridge, but with no specific collection numbers. They were not large plants when they came, being some 3 to 4 inches in diameter, but were obviously of some age as they had folds of old spines at the base and tended to be fairly flat. The bodies were a leaden grey green to bluish colour. They have not significantly increased in diameter but have grown markedly taller, in one case up to 4 inches high. All of them look as though they have a tendency to grow columnar but what the ultimate height will be I do not know. These plants have retained their colour well and I feel that they do not appear to have grown out of character. They have certainly maintained their thickness and have not become thin. The larger plant has 13 ribs and the other two have 9 and 11 but are smaller plants. The spination of these adult plants is rather variable, which become somewhat thicker and longer as the plants mature. When the plants were smaller the spines were mainly radials but now they have 1-3 longer central spines. None of them are what you would call very long or wildly spined, but look somewhat similar to the Backeberg picture of v.janseniana, or possibly between that and his v.leucacantha.

In addition I have two plants grown from seed which originated from R.Kiesling. These will now be approaching ten years' old and are both about 2 inches in diameter and 1 inch tall, with only radial spines and no central spines. One has 9 ribs, the other 11/12 due to rib division. The age and size indicate that they are somewhat fatter than tall - the habitat plants seem to have grown more in comparison. The body texture is extremely hard. I have just unpotted one of the seedling plants to check on the roots and can say that they are substantial even on these small plants. They consist of a number of carrot-like growths connected to a large bulk directly under the body. There is no constriction - the body merges directly into the large bulk of root from which the carrot-like roots descend. Pots appear to restrict them considerably and they would appear ideally to prefer longer and particularly deeper quarters.

All these plants, including the seedlings, are very free flowering. The seedlings have flowered for at least five years, when they were about one inch in diameter. It is strange how small plants of slow growing species often flower, Smaller plants, however, do tend to produce somewhat smaller flowers. On the mature plants the flowers are large at about 3 inches in diameter. They are in shades of yellow and orange with a pink to slightly darker throat. Looking down into a flower, the stigma lobes appeared to be a dull yellow ochre. On splitting the flower, the style was a shiny purplish red. The stigma lobes were also this same colour, only they had a matt surface covered with pappillae which were of the yellow ochre colour. This colour was not because pollen was adhering to the stigma, as I had at first thought, and in any event the pollen was a slightly whiter shade of yellow.

As for cultivation, these plants do best for me in a soil based compost but are happy with regular watering. They do not want to be constantly dry. They can endure cold temperatures in winter if dry - certainly on my environment down to -10°C. They do not appear to mind dampness in the winter. They show when they want to grow in the Spring by producing new fresh brightly coloured spines in the crown and after watering they grow markedly. On all plants the old spines are bluish black with some grey ones and all look fairly similar. They are grown in full sun and do not seem adversely affected by it. Some plants with similar body texture, like Gymnocalycium glaucum, do not seem to appreciate full sun for some reason. This is also the case for some of the Acanthocalyciums. It may be linked to their liking for full sun but cool temperatures which many cacti seem to like and need!
.....from H.Middleditch

The wide range of variation to be found in L.chrysantha from the relatively small compass of the Quebrada del Toro may be judged by the three accompanying illustrations together with the photograph of L.kuehnrichii on p.118 of Chileans No.51. But it would appear that all these forms produce either a yellow or copper-yellow coloured flower. Various Lobivias from outside the Quebrada del Toro e.g. Quebrada Humahuaca, Valle Calchaquies, appear to include forms similar to one or other of the forms of L.chrysantha, and may even display yellow flowers amongst other colours. Nevertheless it does appear to be possible to segregate the Lobivia from the Quebrada del Toro (excluding L.chorrillosensis) under the name of L.chrysantha. On the basis of prior publication it appears that the name L.chrysantha should be sunk into synonymy under L.kuehnrichii Fric. However, it would be preferable to retain the name L.chrysantha to avoid confusion with the application by Rausch of the name kuehnrichii to Lobivias from areas outside, but adjacent to, the Quebrada del Toro.

THE CACTUS POPULATIONS IN RIO GRANDE DO SUL TODAY By N.Gerloff
Translated by W.W.Atkinson from Succulenta June 1990

From December 1989 until early January 1990 I had the opportunity to gain an impression of the chances of survival of the genera Frailea, Notocactus, and Gymnocalycium in Brazil's southernmost province. In order to be able to see in the wild what in Europe are such cherished plants, I had to travel more than 3000 km with my two Brazilian cactus friends to visit about fifty growing places. There is now only a fraction of the original vegetation to be seen and these restricted places are to be found at the edge of economic development areas.

Rio Grande do Sul has become characterised by an intensive use of available land, and has favourable climatic

factors. For rapidly developing Brazil, the south is a profitable growing region in which the state happily invests money. Rio Grande do Sul is becoming dominated by cattle farming and agriculture. Agriculture alone takes 22.5% of the surface area and is thereby one of the biggest such sectors in the country. In those parts suitable for irrigation, rice is grown. Maize, soya, cassava, tobacco and potatoes are grown in rotation. Around Caxias do Sul are vineyards, begun by italian immigrants; in small plots by the houses people grow black beans and sweet potatoes for their own use.

The province has the highest density of cattle in the land; on scarcely 7% of the area of the whole country there are 12% of all Brazilian cattle and 60% of all the sheep! The production of meat and wool is correspondingly high. Because many of the products are used in other provinces, a relatively extensive road network is necessary.

Around the cities are to be found specialised forms of agriculture such as the dairy industry (by Porto Alegre) and horse breeding (by Bage). These grazing animals live exclusively on the natural vegetation, which is only broken by rocky plateaux. The farms (fazendas) are often many km apart. Traditionally the grass is burnt off in the winter, so that the young shoots can grow better in the spring. Of the 50 or so habitat spots that we visited, about 80% were scarred by fire. Naturally fire cannot assail the bare patches, but it is only for that reason that a few cacti are still to be seen in such patches, and in rock crevices.

The relatively intensive cattle farming must be the biggest threat possible to habitats; because of their soft epidermis and/or light spination, species such as Gymnocalycium denudatum, Notocactus ottonis, and almost all the Fraileas are easily trampled or eaten. Sheep and goats chew every accessible spot bare. Only small plants can find protection in cracks or under Opuntias. Here and there hedges and fences provide temporary protection.

Plants continue to be damaged by animals, but the burning off of dry grass is such a widespread habit (also in other provinces) that I found only a few patches that had not been assailed by fire:

Total visited places	50	100%
Fire traces and fire damage	41	83%
Grazing and animal damage	46	92%
Road construction damage	14	28%

The economic politics of Brazil are determined by the heavy population increase and rapid urbanisation. In the first place intensification of agriculture has to fill all stomachs and thereby halt the drift from countryside to town. Where a subtropical climate and fertile soil permit, surpluses must be produced. The state makes heavy demands on agriculture. Cacti are regarded by the natives as weeds because cattle can injure themselves on them, and therefore large specimens of Malacocarpus and Echinopsis are dried and later burnt. From the standpoint of the European passion for these plants, this defies belief. Almost a dozen habitats that my guides had known for years must now be regarded as extinct. Occasionally, after long searching we found a few plants, amongst rubbish or on patches that had by chance remained undisturbed. Three of the nine habitats of Notocactus scopa were near enough annihilated. Nevertheless I found two colonies on the border between Brazil and Uruguay, whose continued existence seems assured. The frontier situation protects this area from further intensive development for agriculture.

But then there is the road building which brings a great problem for the cacti. As well as the asphalt highways there are many unsurfaced roads around the country, connecting the developing areas to the cities. The Brazilians are rightly proud of their infra-structure. The unsurfaced roads are relaid or widened every couple of years, so that the road maps are often out of date within ten years. To avoid using fertile land, these roads are laid through stony areas, which we must now regard as the last free places for cacti. Of the nearly 1600 km of dust roads that I drove along, about 25% was either recently built or under construction. In practice this means the destruction of plants in the verges. This zone between the roadway and the cultivated land has so far offered many plants a safe haven, but it is now being buried by construction activities. So, for example, to the south of Lavras do Sul, plants such as Notocactus crassigibbus, Gymnocalycium denudatum, etc, were completely buried.

Brazilian politicians concentrate upon improvement of the economic structure of the country and satisfying the needs of a growing population; they have no concern for the “exotic” hobby of a few Europeans.

Alas the necessity of preserving the riches of the plant world by means of appropriate regulations does not come into Brazilian thinking. There is also a shortage of money for such regulations - such as bringing threatened species into botanic gardens and reservations. The Botanic Garden of Porto Alegre, where alas there are no cacti, is an example of a project that can attract criticism. The location of the garden - on the edge of the city - has to compete with a camping ground near Itapua.

The Convention of Washington and national import rules severely restrict the taking of cactus plants. This also affects the few plants that could be taken to Europe for breeding and distribution in order to preserve the species. Unfortunately, people in Europe believe that through these import restrictions and other customs regulations, plants in the wild will be safely conserved. This is a tragic mistake which will lead to virtual destruction of the yet remaining plants in Rio Grande do Sul. In my opinion it is not the individual cactus amateurs who will destroy the populations; it is the opening up of land and the intensification of soil use which will see the end of most of the cactus populations of Rio Grande do Sul.

SOME CACTUS LOCATIONS IN SOUTHERN BRAZIL TODAY. By W.R.Abraham
Translated by J.Brickwood from K.u.a.S. 41:7,1990

During December 1987 and January 1988 we undertook a journey with the combined purpose of searching for cacti and examining the habitat areas of others that Rudi’s father, Heinrich Bueneker, had discovered some 30 to 35 years previously. We here report the findings of our investigations at these habitat locations.

About twenty years ago, Rudi discovered a species of Frailea north of Santiago, which was ultimately described as F.curvispina by A.F.H.Buining and N.Brederoo. We spent almost an entire day trying to rediscover its type location. At first we could not find this location, but following a long search we at least established beyond any doubt that the rocks on which these plants once grew, in places accompanied by Notocactus linkii, had undoubtedly been excavated and used in the construction of a nearby bridge. This, together with the fact that the land in this area has now been put to agricultural use, with only the odd rock or two peeping through the soil even being remotely suitable for cacti to inhabit, suggests that we must presume that Frailea curvispina has been exterminated.

We met with another example of the destruction of cactus habitats near Itaqui. Two years previously Wolf-Rainer was shown a fairly large growing, clumping species of Frailea by Antonio Gutierrez that grew on rocks near a pond. However, although we made a thorough search at this locality and in the surrounding area, we could no longer find any

Fraileas there. The terrain and the rocks in the vicinity of the pond had been broken up and levelled and is now merely an open space ready for the construction of a large building project. A variety of N.arechavaletai (Speg) Herter, which used to occur nearby this area has also vanished; the ground on which it used to grow has been similarly broken up ready for development. Preliminary investigations of the Frailea that once grew near Itaque that are still in cultivation, suggest that it is a previously undescribed taxon, yet we now have to report that this new species no longer exists at this location.

In the course of our journey we also studied some Brasiliparodia and in particular sought out the location of B.catarinensis Ritter. This plant was another of Heinrich Bueneker's discoveries, who found it near Bom Jardin da Serra. Fog and heavy rain considerably hampered our search for the location of this species, but finally we came across the rocks amongst which this cactus once grew. Unfortunately we must use the term 'once grew', because although the terrain itself remains unscathed, as far as we could possibly establish, the cacti had all disappeared. The location of Brasiliparodia brevihamata v.mollispina looks sure to be destroyed in the near future. At present the habitat is very small, being restricted to an area of about ten square metres. Unfortunately, since this area is currently being surveyed by building inspectors, it is likely to be completely destroyed very shortly.

The type location of Notocactus linkii v.buenekeri Ritter has also become very restricted and seriously threatened. About ten years ago there were still two places near Garibaldi where this variety could be found. One of these locations has since been concreted over in preparation for the building of a church. The other location has been divided by the construction of a road with one half used for residential construction, whilst the other half increasingly serves as a refuse tip for the inhabitants.

These are just a few examples and unfortunately we must note here that we could list still more examples of habitat areas which have been destroyed. The industrial and agricultural exploitation of southern Brazil, together with the associated road construction, is solely responsible for the destruction of many cactus locations in this region. However, no secret should be made of the fact that commercial collectors have also been responsible for the extermination of certain cactus populations. For example, Peter Schlosser, together with a fellow enthusiast from Europe, still found around fifty examples of Notocactus schlosseri Van Vliet in April 1982 at the type location in Uruguay. But in December of the same year, Hugo Schlosser and W-R.Abraham found only a handful of examples remaining at the same location. In the intervening period, cactus dealers journeying through the area evidently had that species earmarked on their collection list and plundered the habitat location. Even the imprecise statement as to the type location given by Van Vliet did not help prevent the near extermination of this species in this particular case.

However, it is important to note that unscrupulous dealers and collectors are not to blame for the extermination of the majority of cactus locations presently lost to us - most have disappeared simply as a result of the destruction of the landscape. It is extremely important to state quite clearly here that consequently any legislation with regard to the collection and export/import of cacti will not prevent the continued disappearance of most cactus locations. Regarding land cultivation, other authors, in particular Pierre Braun, have repeatedly commented and made suggestions as to possible remedies for the problem, especially concerning central Brazil. In southern Brazil it is largely a result of the indifference or plain ignorance of the inhabitants that has caused the complete extermination of cactus species or their restriction to very limited areas - often only at one small location. Thus the construction workers, for example, certainly had no idea that Frailea curvispina grew among the rocks used in the construction of the nearby bridge, any more than the labourers who concreted over one of two locations of N.linkii v.beunekeri. It falls to the Europeans in general, and cactus enthusiasts in particular, to inform the local inhabitants of the error of their ways; although of course it is easy for us to preach and condemn their activities. Have we treated our own landscapes any better? Are our woods and forests really that better protected? What has happened to the fens and bogs of north Germany? Where are the wolves, the lynx, the storks, the crayfish and the wild orchids? This list could be considerably lengthened. No cacti are involved, it is true, but that hardly justifies matters. Brazil is a country in which most people, in comparison with Europeans, live in unimaginable poverty. How can we condemn or reproach such people if they need to utilise every square metre to build on or to cultivate?

Clearly it is the aim of all of us to try and protect cacti from extermination in habitat. Brazil, for its part, has prohibited exports of cacti to try and preserve populations in the wild. But how can you preserve species when regardless of such protection, habitat areas are being broken up, dug up, flattened or cleared and the plants minced because the local inhabitants themselves show no concern for these actions? Regrettably it very much appears to us to be the case that the world's Botanic Gardens, and particularly those of Brazil, seem rather reluctant to accept or take on any responsibility towards dealing with this problem. Yet under the present circumstances it appears to us that the only realistic way to preserve many of the endangered species is to cultivate and propagate them within the larger botanical collections. At present, the propagation of pure species and their widespread distribution among many collectors seems to provide the most certain guarentee of their preservation. In this respect the serious enthusiast here has an important role to play, almost an obligation, in fact - that is to propagate and exchange plant material or seeds of known habitat origin with other enthusiasts. In a noteworthy and very readable article on this subject, R.Oeser has already provided several practical tips in this very Journal.

The list of exterminated species is already long - much too long, in fact. As one searches in vain for particular discoveries of F.Ritter or of A.Buining and is forced to acknowledge their increasing disappearance in the wild, it seems to indicate to us that we should correspondingly become more concerned to ensure the preservation of the rarer cacti existing in cultivation. Many cactus locations are already destroyed, many taxa have been lost, others at present exist only in cultivation. The species which have been lost cannot be replaced, so our task in the protection of species must chiefly be to preserve species which at present still exist in our collections - and that is the responsibility of all of us. Perhaps there will come a day in the future when it is seen as a disgrace not to propagate the rare species in our collections and distribute them to others. And that time may not be too far away.

DISCOVERING WHAT SORT OF AUSTROCYLINDROPUNTIA? From F.Vandenbroeck

The Austrocylindropuntia are a group of plants that I find exceedingly difficult to distinguish or clarify. In the field they are exceedingly variable and often hidden away under a dense cover of spines which makes any closer examination somewhat unattractive. On our trip to Bolivia in 1988 we found a small Austrocylindropuntia with spherical fruits at two places, near Otavi and near Tiraque. The plants are small (up to 15 cm tall) and display white woolly hair at the areoles. There did not seem to be many plants at the spot where we found them. The fruits of the plant near Tiraque were very fleshy and juicy (red jelly) within. I remember the plant near Otavi growing amidst and under small bushes. Near Culpina

and Tiraque they were growing in open terrain. The plant near Culpina was similar to the others but with red spines. Up to now I am rather uncertain as to the identity of all these plants.

.....from H.Middleditch

The photograph taken near Tiraque by F.Vandenbroeck is of an Austrocylindropuntia growing on what appears to be rocky ground. There are no shadows on this photograph so presumably, as Vandenbroeck says, it is growing fully exposed to the sunlight. In the immediate vicinity there are a few short dried up twigs and what appears to be an isolated tussock of grass. The plant looks as though it is roughly 6" to 8" tall, with three or four branches growing straight outwards from the main stem, from above the base. The stem and branches may be some 25 mm in diameter, the branches perhaps 3" or 4" long. The thin, sparse, spines may be up to 30 mm long. In this photograph it is not possible to see any hair at the areoles. The plant carries nine bright red fruits. These fruits are globular to ellipsoid, with a diameter more or less equal to the thickness of the plant stem, that is, about 25 mm. The fruits appear to have a smooth surface, without any tubercles, and carry a pattern of regularly disposed prominent white tufted areoles. There is no hair at these areoles. The scar on the fruit left by the detached flower remains has a diameter of approximately one quarter of the diameter of the fruit; the scar may possibly be 6 or 7 mm in diameter and looks quite small in comparison with the size of the fruit.

The first thought as to the identity of this particular plant would be A.teres, which is often regarded as a hairless form of A.vestita. But A.teres is associated with the La Paz valley, a considerable distance from this particular spot. The globular to ellipsoid bright red fruits with the prominent white areoles and the small floral scar are quite different from the bowl-shaped fruits with a large floral scar that appears to be typical of the hummock-forming Tephrocacti.

.....from F.Ritter, Kakteen in Sud-Amerika

By comparison with the fruits on Cumulopuntia, the fruit on Austrocylindropuntia are ellipsoidal and the diameter of the floral scar is much less than the thickness of the fruit.

.....from J.Iliff

From the slides taken in Bolivia by F.Vandenbroeck of various Opuntia, the Tiraque and Otavi plants are both undoubtedly O.shaferi. One can tell from the bright red, white-areoled fruits, which are very sweet and (so it seems to me) taste very faintly of pomegranate. The Culpina plant is less certain. The photo is dark and taken against the light - but I imagine it must be the same. It is very likely. It is more heavily spined, but the spines do differ on the other two. And it is difficult to know what else to suggest. You could say O.weingartiana if you believe that this is distinct. The evidence suggests that this more heavily spined plant is connected by intermediates with O.shaferi. O.teres also lives in this general area, but this seems to be merely a less hairy form of O.vestita and I would not have thought applicable. Ritter thinks O.shaferi is the same as O.vestita, but the very bright red fruits of O.shaferi are a reliable character; those of O.vestita are a dull purple and the seeds are different, too.

.....from J.Kirtley

On the trip to Bolivia undertaken with B.Bates in 1989, we travelled south from La Paz towards Potosi, making a stop for an hour or two at a spot some 40 km before we reached Potosi, not far from the R.Pilcomayo. Here we left the vehicle by the roadside and, in order to examine the nearby hillside, walked across the flat valley floor which was given over to agriculture. As we neared the hillside we could see that it carried little in the way of vegetation, just scattered bushes and the occasional tall Oreocereus. Mostly it was bare rock. On climbing the lower slopes of this hillside we found a few isolated tussocks of grass, as well as the first Parodia we had come across in Bolivia. A long spined Lobivia was fairly common here.

It was in this area that we found several plants of Austrocylindropuntia. Some of them were entangled in a low growing many-branched bush or shrub; others were growing between broken rocks where they were fully exposed to the sun and had spines up to about 3" long. What at first looked like three or four separate stems of an Austrocylindropuntia growing up through a tangle of low shrubs proved on close examination to be a decumbent stem about a yard long, of which about a foot of the growing end was upright. There were four or five branches growing at intervals along the decumbent length. We then walked down the easy slope towards the stream, over pretty bare ground. We found one or two more Austrocylindropuntia growing between some very large stones, with stems shorter than those we had just seen on the steep slope. On the stems of one or two of these plants there was the odd bright red fruit.

A day or two later, when we were south of Potosi, some 20 km south of Cuchu Ingenio, we came across similar plants of Austrocylindropuntia which were mostly growing fairly upright in the midst of a bush. Several plants may have been growing together or individual plants may have had a dozen to several dozen stems. These were fairly well shaded and their spination was not as long as that on the plants which we had seen previously at the site to the north of Potosi. Further still to the south, on the west side of the Pampa Mochara, we came across similar plants; they were colonising the whole of the base of one or two bushes, with hundreds of stems, occupying over four feet across. The stems generally had a hairy appearance. There were new joints growing from the tops of the stems, with fresh green leaves, and there were plenty of green leaves on the bushes. The bushes would not really exceed some 2 m in height but the Austrocylindropuntia could have been over half a metre tall.

On our return route to La Paz we came to Sucre; between here and Ravelo we found some small hairy Austrocylindropuntia which looked just like O.vestita. They were growing at the base of a lichen covered rock in the company of shrubs and ferns. The body colour was a nice green, by comparison with the rather grey green, bluish green, or brownish green of the plants we had seen earlier on the trip. There was one small purplish coloured offset which may have been an unripe fruit.

.....from P.Bello

In August 1994 I was able to pay a visit to Sucre where I was fortunately able to stay with a relative there. During my stay it never rained once and the temperature was around 20° to 24°C by day and -3° to -4°C by night. Unfortunately the only seed I was able to find was of Roseocereus tetracanthus. I do believe that the effect of the rains in January and February, together with the untiring collecting work of the ants, scatter every seed before the dry season. Only Cleistocactus was in bloom and a few Echinopsis already displayed buds, whilst the Weingartia began to flower in the last week in August. As I did not rent a car I travelled about by public transport and on foot, so I was not able to get to all the places I would have liked. Nevertheless it was a most informative experience and I was able to get a close look at several habitat locations. I was able to visit Los Alamos, Quillaquilla, Tarabuco, and Zudanez. There were plants of Opuntia vestita to be seen almost everywhere. There would be many plants in total but few at any one locality, growing well apart from each other. In every location they were growing at the S.S.W. and S.E. sides of the gently sloping hills, either in a position fully exposed to the sun or shaded by bushes or rocks. The number of stems on a plant varied from 3-4 up to a dozen, reaching 10-15 cm high. Those plants which were growing under the bushes were taller and greener than

those which grew out in full sun. Only on the Cerro Calle-Calle, near Zudanez, were there larger clusters with two to three dozen stems and growing up to 20-25 cm high.
.....from H.Middleditch

Growing on the SE to SW facing slopes would give plants rather less exposure to the sun in the dry season.
...from F.Ritter, Kakteen in Sudamerika

Austrocylindropuntia teres This species is very closely related to A.vestita, but it is quite different in its habit on account of the almost non-existent hair and more colourful spines. The original description is very brief. The leaves are green with red tips. Schumann states that they are usually 2 cm long, in nature they are usually shorter. Schumann gives 1-3 awl-like yellow spines which may be related to the influence of cultivation, as in nature the spines are usually more numerous, up to 12 spines can be developed, of which however often only one is situated in the centre and is longer, needle-like, 2-4 cm long, straight, porrect or directed to some degree upwards, usually brown, the remainder or almost all the remainder radiating, of which most are directed sideways and distinctly shorter; hairs occur but sparsely from the lower margins of the areole, lying against the body; prominent glochids in the upper part of the areole. Roots are short and thick. The flowers are very similar to those of A.vestita .... Fruit carmine, readily proliferating. The habitat location has been stated as Bolivia. Up to now it has only been found in the La Paz valley below the city to well downstream. But south of the city it is to be found at more elevated locations, although it does not rise higher than Corryocactus melanotrichus. By comparison, A.vestita is to be found with much more hair only above the city at higher locations, only sparsely and not in the same place as A.teres.

Austrocylindropuntia vestita Under v.shaferi is given data on flowers, fruit, and seed. A flower which I examined on a plant from Quime differed from the variety by the longer pericarpel (2 cm) which was thicker at the base of the petals, the style was pale pink, the five stigma lobes green, otherwise there is no noticeable difference. In 1898 Schumann gave the only flower description which we have had up to now, which was copied by Backeberg in his handbook and by Krainz in his Die Kakteen. It is more or less in conformity with my own data, except for the "four dark reddish-purple stigma lobes". I have only seen green stigma lobes on this species. Fruit like vestita v.shaferi, but proliferating. Habit, appearance of the branches, areoles, and spination shows no noticeable difference from and is pretty well in accordance with the description by Schumann. In thickets, also in shady and similar sorts of places this species can become 1 m tall. FR 891 from below Yamparaez and FR 1047 from 50 km to the east of Cochabamba.

Austrocylindropuntia vestita v.shaferi

Syn. Opuntia shaferi Br & R., Austrocylindropuntia humahuacana Bckbg.

According to Britton & Rose Opuntia shaferi grew to 30 cm tall; stem round, 25-35 mm thick, very spiny, low tubercles often flattened, leaves deciduous 6 mm long; areoles 1 cm and less apart, round, white, with numerous white glochids; spines ca.6 brownish, needle-like, often 4-5 cm long, with long white hair as well; fruit globular, about 2 cm diameter, with numerous large white areoles, with glochids and hairs, without spines. From between Purmamarca and Tumbaya, Prov. Jujuy.

This data corresponds well with the variety of A.vestita which is growing in that area, except for the spines which are unusually long as stated. The reason for that however lies within their description, since the quoted place lies at a lower altitude than the main habitat, which lies on the adjoining and higher mountains. In the course of the ascent of one of those, the hairiness tended to become less on account of the less intense insolation, the spination however becoming more robust on account of the greater aridity. Under conditions of cultivation both tend to reduce. Flower from the mountain above Volcan .... Fruit Blood red, globular to ellipsoidal, 18-35 mm long, 18-25 mm thick, almost etuberculate, floral scar very slightly sunken to level, 7-10 mm diameter; areoles yellowish to white, 2-4 mm diameter, 4-7 mm apart, with curly white 1-2 cm long hairs with upwardly pointing or diverging bunches of pale yellow to brownish glochids of several mm in length; areoles to the base of the fruit; sidewalls 3-4 mm thick; sparse, very juicy, red, sweet pulp inside the fruit; in comparison with the Type of the species the fruit is not proliferating. .... Distribution from the mountains of Volcan, Prov. Jujuy, up and in to the departments of Tarija, Potosi, and Chuquisaca in south Bolivia. In general growing more to the east, i.e. in somewhat moister areas, than the very closely related A.weingartiana which inhabits the same area, at elevations from about 2200 m to 3500 m. At the lower end of its altitude range the hairiness is very sparse, but spination more robust. Towards the north there will probably be found transitions in this variety to that of the species type in the Departments of La Paz and Cochabamba.

Austrocylindropuntia weingartiana The principal difference in comparison with A.vestita lies in the more numerous, longer, downwards, rarely upwards, pointing brownish red to brown, occasionally white, spines and in the only very few long hairs. The root is short and thickened. .... Flower very similar to the flower of A.vestita. .... Fruit like A.vestita with a somewhat smaller fruit scar. Fruit in many places proliferating, in others not. Type location, Tupiza in Bolivia. To be found near Iturbe, Prov. Jujuy and in many places in departments of Tarija, Potosi, and Chuquisaca, Bolivia, at similar elevations to A.vestita, but in more arid areas. It is very closely related to A. vestita, but they never appeared to grow together.
.....from H.Middleditch

To judge by the foregoing descriptions from Ritter, the fruit on all these sorts are pretty well identical - bright red globular to ellipsoidal fruits. Yet when J.Iliff came to The Chileans' weekend he showed us a slide of three fruits, only one of which was more or less ellipsoidal, bright red, with prominent white areoles and no hairs, stated to be from O.shaferi. This one conforms to Ritter's foregoing descriptions. The second was of similar shape, more purplish in colour and greenish-brown at the base, but carrying untidy hair at the areoles, stated to be from O.vestita. The third fruit, for comparison, was a yellowish-green bowl-shaped fruit, nearly naked, with a large floral scar, typical of hummock-forming Tephrocacti; it was off an O.tilcarense. In hindsight it is not altogether clear whether it was the intention to suggest that the differences in the fruits of O.vestita and O.shaferi which were to be seen on the slide (particularly the colour) were typical of these two sorts.

It is suggested by Ritter that the description of A.vestita by Schumann conformed pretty well to the A.vestita which Ritter met with in habitat. For the fruit of A.vestita, Schumann gives "ellipsoidal berry, 15 mm long, 12 mm in diameter, carmine red, with floral scar, enveloped in wool. Insipid taste". It is possible that a fruit produced in cultivation was not as large as those in habitat, but the red ellipsoidal berry appears to match Ritter's ideas on fruit.
.....from J.Iliff

The fixed reference, which I am reasonably certain of because I saw the plant myself at Volcan, is O.vestita. The plant was entirely representative and the fruit is faintly green but almost entirely overlaid with reddish-purple, and woolly. I did not see the O.shaferi plant because it was distant and I was somewhat incapacitated with back trouble, but it was adjudged to be shaferi by the company which included Hunt, Barthlott, Leuenberger, Anderson & Kiesling. The fruit

is the bright red glabrous one which you have referred to above. It is curious that, as far as I can see, Ritter does not notice the bright red, quite glabrous fruit - such a striking character - either under weingartiana or anywhere else.
.....from M.Nilsson

When we were travelling along the Quebrada Humahuaca we did find Austrocylindropuntia vestita at Volcan; it did have red fruits. There were only red fruits to be seen, none of any other colour.
.....from H.Middleditch

From the foregoing descriptions by Ritter he quotes for:- A.shaferi, fruit blood red, globular to ellipsoidal ...; A.vestita, fruit like shaferi; A.weingartiana, fruit like vestita; A.teres, fruit carmine. Consequently I am at a loss to understand the comment by J.Iliff that "Ritter does not notice the bright red fruit either under weingartiana or anywhere else". Indeed Ritter's statements about the fruit seem to be in line with Schumann and suggest that the fruits are more or less similar on all these sorts.

In Ritter's Kakteen in Sudamerika there is a flower section of A.vestita v.shaferi (Fig 251) which shows the bristly hairs on the tube and pericarpel; his Fig 250 is of a plant in flower, with much more curly hair on the flower tube and pericarpel. His Fig 559 is of a plant of shaferi carrying both flower and fruit, each areole on the fruit bearing tufts of untidy hair. This last plant carries less woolly hair than does the plant in his Fig 250. From this comparison it appears that the amount of hair on the fruit is quite probably in proportion to the amount of hair on the plant, so that a hairless plant will have a hairless fruit and a very hairy plant will have a pretty hairy fruit. Hence it becomes difficult to see how the degree of hairiness on the fruit can be used as a basis for separating e.g. shaferi from vestita.

The flower tube, as on all Opuntioideae, will look pretty much like a segment of the plant and so it will be green until the flower starts to wither. It is not likely to change from green to red in the blink of an eye, rather will it probably pass through transition colour or colours to some degree or other before the fruit is ripe. This will occupy some period of time, be it long or short. It is my impression that the hairy fruit of a green colour suffused with purple, brought back from Volcan by J.Iliff, is merely an incompletely ripe fruit which would become the bright red colour of Schumann and Ritter once it had ripened.
...from J.Iliff

You are quite right that an originally dull purple fruit might become bright red when ripe. However the red fruit and the purplish fruit on the slide (shown at The Chileans' Weekend) were of the same season, and in fact found within a day of each other. The fruit does indeed need further observation to see if this distinction is valid or not. Again I would agree that the floral parts "rhyme" with the vegetative, and a hairy plant is likely to have a hairy receptacle and fruit. Once again this is a character which needs further observation: is the presence of hair diagnostic, or not? I would point out, though, that while big obvious differences may be incidental, small differences may be significant if they are consistent.

As to the colour of the fruit, it would never occur to me to call the bright red fruits "blood red" - it is not a term I would ever use anyway. In any case it could mean one of two or more different tints according to the kind and age of the blood. Having once painted, I think of pigments, and I would call the fruits in question vermilion.
.....from M.Nilsson

Near Tilcara we came across an Austrocylindropuntia which we believe to be A.weingartiana. It fits the Ritter description of the spines quite well. The fruits are similar to those on A.vestita - round, red, juicy, and with white glochids.
.....from J.Lambert

Travelling along the Quebrada Humahuaca we drove north out of Humahuaca itself. All along the road from there to Aparzo I remember we encountered A.shaferi, although perhaps it does not occur in very great numbers. When we reach Iturbe we are already at an altitude of over 3000m. Somewhat hidden amidst the high grass we discover a quite remarkable plant. At first sight one might mistake this for a cereoid species, but a closer examination reveals that the tips of the stems bear small leaflets, and hence we are confronted with a member of the Opuntioideae. This is indeed Austrocylindropuntia shaferi v.humahuacana, also known earlier as A.weingartiana. The fine, downwardly directed spines confer a quite peculiar aspect to the plant, which is therefore known under the local name of "cola de zorro" or fox's tail.
.....from H.Blossfeld, Collecting Cacti in the Puna, G.B. Cactus Journal June 1936

We started off just behind Humahuaca and halted where a lateral quebrada branches off. We climbed up the first stage and came out in a ravine ... then we go further up to the second higher level. Under some wretched thorn bushes Opuntia weingartiana sticks up like fingers, armed with reddish-brown, spreading spines and sparse, short, grey wool in the areoles and on the sides fat, shining red fruits. Such a fruit remains on the plant for a whole year or lies on the ground until the rainy period rots the soft red flesh and the seeds fall to earth.
...from F.Vandenbroeck

The copy of the photograph of A.weingartiana [from B.f.K.] which you sent me was very interesting because I was so lucky as to find this species on a mountain slope near Yavi, close to the border between Argentina and Bolivia. We only saw two or three specimens but they were in flower (December). Typical for this species are the very long spines which are absent in A.verschaffeltii and A.vestita. It is indeed very probable that the plants which we found near Culpina on our earlier trip to Bolivia do belong to this species; the plant bodies and spination are identical and the distance between Yavi and Culpina is not enormous. It is my impression that the occurrence of Austrocylindropuntia is rather scarce; when you hit upon the plants you never find many of them, four or five at the most, some plants even seem to grow quite isolated. I remember that on the same mountain slope near Yavi we found one specimen of A.vestita. The flowers of A.vestita are somewhat purplish, those of A.weingartiana pale red, and those of A.verschaffeltii scarlet. The most impressive specimens of A.vestita we found near Juella, in a side valley of the Quebrada de Humahuaca, where they were growing under bushes, flowering and fruiting.
.....from H.Middleditch

Did these fruits match the description given by Ritter, or was it more in line with the fruit found by J.Iliff?
.....from F.Vandenbroeck

When I look at the slide which I took of this plant I can see dozens of branching stems which are carrying forty or more ripe fruits, all red, round to ellipsoid in shape, with white areoles, and a fairly small scar left by the detached flower remains. The length of the fruit is about the same as the thickness of the stems.
.....from H.Middleditch

That seems to be a reasonably good match for Ritter's description of the fruit.
.....from R.K.Hughes

In the month of December 1992 I went to Bolivia in company with B.Bates and P.Down. In order to maximise the

number of interesting species seen, considerable distances were travelled quite rapidly between known habitats. In this way we covered over 2,000 miles in three weeks and one day, stopping at 67 different sites, of which only a few were unproductive. We came across the first of the plants that I would take to be Austrocylindropuntia weingartiana when we were on the road to Potosi, at a considerable distance past Ventilla but not yet at Cieneguillas. A magenta flower of this species was spotted by B.Bates and we stopped here, at 3910 m altitude. Shortly after Cieneguillas we stopped again, at 3555 m altitude, and found more of these plants, some of them bearing fruits. From two fresh fruits I obtained 48 seeds and from two old fruits I removed 88 seeds. Further plants of this sort were found to the south of Cuchu Ingenio, at Viticha, and at 3467 m altitude to the north of Iscayache. Above Salitre, at 3115 m altitude, we found more of these plants and there I obtained 17 seeds from a fresh fruit. Finally we saw some to the north of Betanzos where I obtained 84 seeds from various sorts of fruit.

The flower colour of these A. weingartiana was typically magenta pink to purple, whilst just a few leaned towards pillar box red. The fruits are green at first then turn pink on ripening. The ripe fruit would be between three quarters of an inch and one and three-eighths of an inch in diameter. If a fruit is just ripe it will be still quite firm and solid, requiring to be twisted or cut from the stem. When fully ripe it will fall from the plant on its own or with the slightest touch. Even when handled gently, a ripe fruit is liable to burst open and release a pink coloured, watery pulp. The pink stain which is left when this happens does seem to be water soluble and can be washed off, unlike the coloured pulp in some other sorts of fruits. Much older fruits were found at the base of some plants. They had obviously fallen off and remained untouched. They had dried out, leaving the seeds inside a thin, woody skin, still protected by the deadly glochids.

On close examination I usually found it possible to separate A.weingartiana from A.vestita. The former are usually larger in both the height and diameter of their stems. Also it was extremely well armed with fine spines and glochids, some up to one inch or more in length, that made even careful handling very difficult. The fruit on A.weingartiana also tend to be somewhat larger than those on A.vestita. However, I do have a piece of A.vestita that is equal in diameter to one or two pieces of A.weingartiana.

On reflection, after our return home, I now think that all the other plants of this group which we saw were Austrocylindropuntia vestita. We saw fewer flowers and fruit on this species and they appeared to be little different to those on A.weingartiana apart from being perhaps slightly smaller: at Cerro Churuquella, Sucre, one fruit yielded 15 seeds; at Los Alamos 2 fruits gave only six seeds; on the road from Sucre to Tarabuco one fruit gave 15 seeds. Near Los Alamos I saw a 27 inch tall stem completely hairless, but it was the most extreme of a group of plants amongst bushes and herbage, in damp earth, showing untypical lush growth. Not many yards away in bare stony earth that looked bone dry, grew plants looking like what we had come to expect for A.vestita. The hair on those A.vestita which we saw was very poor and nothing like that on plants in cultivation. This could be due to cultivated plants being from selected clones, which we did not come across. Also it could be due to exposure to the weather; after I had put my T.floccosa out-of-doors for the summer a lot of hair was soon shed from the plant because of the wind and rain. There was no indication that altitude affected the hairiness of the plants which we saw.

I saw no plants which I would recognise as A.verschaffeltii.

.....from M.Nilsson

During our visit to Argentina in August 1993 we crossed the mountains from Iturbe to Iruya and spent several days trekking from Iruya into the surrounding mountains. Near San Isidro, at 2500 m altitude, we came across some plants of Austrocylindropuntia humahuacensis which were carrying ripe fruit. I am sending you one of the fruits we collected off MN 222.

.....from H.Middleditch

This fruit is about 22 mm long and some 17 mm in diameter, ellipsoid in shape, with a floral scar of 7 mm diameter which is slightly sunken. The fruit is a rich pink colour, bearing about 24 white areoles of 1-2 mm in diameter. It was on display at the 1994 Chileans' Weekend, together with a habitat slide of a plant in fruit. By the time of the 1995 Weekend, this fruit was a washed out pink colour, but still showing no signs of splitting open.

.....from R.K.Hughes

The fruit from M.Nilsson looks more globular than the elongate fruits which can be seen on his habitat slide of these plants. It looks similar to those fruits we found on A.vestita.

.....from F.Vandenbroeck

On our visit to Bolivia in November-December 1992 we saw lots of plants of A.weingartiana. They seem to be widely spread and pretty numerous. We had a good look at them and found that some specimens may develop more hairlike bristles in the areoles than others. The same applies to spine length - it varies considerably. That is why I now believe that the plant which I photographed near Otavi on my previous trip to Bolivia, is also A.weingartiana, as well as the plant pictured by J.R.Kirtley on the Challapata - Potosi road. In a ravine near the centre of La Paz we found another interesting Austrocylindropuntia. The plant segments remained rather short but tended to form larger groups; they carried long spines. Possibly this plant may be A.teres. It was growing together with Corryocactus melanotrichus and a tall Austrocylindropuntia (A.subulata?).

.....from R.K.Hughes

I would say that the Austrocylindropuntia photographed by F.Vandenbroeck near Otavi and near Culpina are what I would regard as A.weingartiana, although we perhaps saw more of the taller, open, straggly clumps, similar to the plant photographed by J.R.Kirtley north of Potosi. This last one has a spination very like my plants raised from seed.

.....from K.Preston-Mafham (At Chileans' 1990 Weekend)

In the La Paz valley we came across Opuntia teres, downstream from La Paz itself. It is possible that this plant is a miniature form of Opuntia vestita. It was a tiny plant and the flowers were only half an inch across. We did not see many of these plants and we did not find several of them growing close together. We came to the conclusion that they were not numerous. Further to the south, when nearing Potosi en route from Sucre, we did come across Opuntia vestita and it carried a much bigger rich red flower. There were fruits lying on the ground which had dropped off the Opuntia teres and some of them had rooted down. We did collect some seed from these fruits but so far we have not been able to germinate it. The bees which were pollinating the flowers on these plants were the same genus as those we saw pollinating flowers on the Rebutia, further to the south. Bees are probably the major pollinators in the Andes of Bolivia.

.....from J.R.Kirtley

We found a few plants of Austrocylindropuntia teres in the La Paz valley. For every ten plants which we found growing at the base of a bush, which must have given some degree of shade, we found one plant growing away from bushes and exposed to the sun. We did see an occasional red flower, and quite a few fruits, which were a bright red colour.

.....from D.J.Ferguson

During our trip through north-western Argentina in early 1990 we saw both Austrocylindropuntia shaferi and A. humahuacana, which I would say are forms of the same species. The only real difference being whiter spines and considerably more wool on shaferi. I have seeds of these two and will hopefully get them to grow so that I can study them in all stages. They are both close to, but more robust than, A.vestita.

.....from H.Middleditch

Does "more robust" mean that they are usually of greater stem thickness than A.vestita? Or more spiny? Would the fruits from which the seeds were collected have been similar in shape, size ,and colour, to those reported by Ritter and others?

.....from J.Iliff

A little while ago I was at Kew and made a point of finding out what I could about O.shaferi. The Br. & R. key distinguishes shaferi from vestita on thicker stems (3 cm), longer spines (5 cm) and fertile fruit; the description adds that the fruit has glochids and hair. There is also an isotype in the herbarium, collected by Shafer. My notes on this, in summary, are;- Segments 9 x 2.5 cm, possibly narrower before compression, ca. 100-areolate, spirals possibly 6/10 or 8/13; areoles ca. 7 mm apart; spines about 8, up to 5 cm, plus shorter, weaker, bristles. No sign of hair, unless some curved bristles less than 1 cm are taken to be hair-like. The spines were mostly descending, but this may be an artifact of preservation. Unfortunately no flower or fruit.

My tentative conclusion is that it is the Br.& R. description which is either careless or confused or both. In the first place I doubt whether the sterility of O.vestita fruit is reliable. The fertile specimen which I saw near Volcan had all the hallmarks of vestita. In the second place their ascription of "long white hairs" to O.shaferi is, in view of the lack of hair on the isotype, puzzling and somewhat dubious. At least it can be said that it is not a reliable character.

There is also the question of Ritter's Austrocylindropuntia chuquisacana, the original description of which I examined closely. This is fertile, and fits O.vestita in every other respect. I do not think that Ritter's objections about flower colour and one or two tiny details are sufficient to separate it.

On the whole I remain persuaded that the slides [from F.Vandenbroeck] which you sent to me showed O.shaferi - if it can be separated from O.vestita at all. It may be that the Br.& R. description indicates intermediates which link the two. However, that bright red and quite glabrous fruit does seem very different. Certainly I would acknowledge that Ritter equates shaferi with vestita. He does this, I see, on the basis of the description; and the isotype does not bear out the description. To get to the bottom of this, the holotype should be examined - this is presumably in the U.S. But there seems to be at least a possibility that shaferi is a nomen confusum if the elements of the protologue do not agree.

One thing I am quite certain of is that there are too many names chasing too few plants in this area. It is possible that there is in fact only one species. The minor differences quoted and the very suggestive disagreement about them rather suggest a group of subspecies at the most.

.....from H.Middleditch

At The Chileans'1994 Weekend we were shown a number of slides by R.K.Hughes taken in the course of his visit to Bolivia in company with B.Bates and P.Down. These included various examples of Austrocylindropuntia vestita, some of which were very hairy and others much less so. We had previously seen photographs of A.weingartiana, many of which displayed a certain amount of hair at the areoles. A picture of what could be a less spiny A.weingartiana might possibly have been a less hairy A.vestita. It became quite evident that it was no easy task to decide precisely where the dividing line was to be drawn between these two species. From other habitat photographs, presented by other speakers at previous Chileans' Weekends, it was also evident that the range or degree of hairiness on Austrocylindropuntia found in the area of the Quebrada Humahuaca varied from those with quite dense and fairly long hair to others with more sparse hair, suggesting that it may also be difficult to separate A.vestita, A.shaferi, and A.humahuacana. Taking this into account, it becomes rather difficult to find fault with the final observation from J.Iliff (above).

A RECORDING CODE FOR PLANT ORIGIN From M.Lowry

For some time we have seen labels bearing the codes H, Z or Y, generally placed in parentheses as a suffix to a field number. The meaning of the codes are as follows;-

(H) habitat plant or vegetative propagation therefrom,
(Z) seedling grown from seed from wild polinated flowers,
(Y) seedling grown from seed produced in cultivation on plants of status H or Z

These codes were originally used by G.Charles to designate the source of a particular plant, whilst in the same way different codes were being used by other members for the same purpose. At the 1994 Chileans' Weekend it was suggested by J.Arnold that the H, Z and Y codes be adopted as a common code by all members of The Chileans. These codes have already come into wider use amongst members of the Chileans, myself included. At the 1995 Chileans' Weekend there was general agreement to adopt this method of coding when selling or exchanging plant material. However, in order to do this effectively we must all agree how to apply the codes to our plants and, more importantly, understand why we are using them.

The very use of such codes to separate plants according to the above criteria implies the recognition of a heirachy in some "feature' of the plants. To my mind, this feature is the genetic potential of the specimen. A specimen designated H represents a combination of characters which exist in the wild and contributed to the variability of the wild population. This is not necessarily the case for a plant designated as Z. It is very unlikely that every seed produced in the wild would survive to maturity whereas in our greenhouses, under optimal conditions, most seedlings will survive. It is possible for plants which we designate as Z to show combination of characters which may not exist in a wild population. With this reasoning in mind the application of code Y is much more difficult to define. If produced from an H x H cross, the seedlings may be considered as equivalent to Z. However, if they are produced from and H x Z or a Z x Z cross they could be genetically much further removed from the original natural population, even to the extent that they are only horticultural varieties, i.e. cultivars. Perhaps we do not need the Y code at all!. A second alternative is to recognise that this coding encompasses an assortment of plants and generate a further coding for the separate components. Of course there may be other, more appropriate solutions to the problem.

Unfortunately the use of the above coding does have one serious disadvantage if it becomes widely used. It may turn the possession of habitat plants into a status symbol and thus generate a demand for habitat collected material. The important distinction which must be made is that a specimen designated as H is not just any old habitat plant, but from one specific location about which we have other detailed information, for example climate, elevation, associated flora and fauna.

.....from G.Charles

The reason for choosing the letter H to represent a habitat plant will be self-evident. When it came to additional codes, it seemed preferable to pick letters right at the end of the alphabet as there are probably no field numbers with a suffix of Y or Z. In this way there should be no confusion between a status code and a field number suffix, even if the parentheses round the status code became illegible, as the writing on a label can get into this condition after a period of time.

.....from H.Middleditch

In any given population of wild plants there are likely to a very large number of plants which will be cross pollinated at flowering time - especially when it is a synchronised flowering time, No single greenhouse will hold anything like a similar number or variety of plants from one population of a species so that an H x H cross in cultivation can hardly draw upon the potential range of variation available in the field. In this way it appears to be probable that the habitat H x H progeny will probably far exceed in number and variety the H x H = Y progeny in cultivation. A batch of Y x Y seedlings may well display but a fraction of the variation to be seen in habitat.

.....from G.Charles

A few years ago I carefully crossed the flowers on two habitat plants of Sulcorebutia torotorensis, and then raised a good batch of seedlings from the contents of the resultant fruit. There was such a range of variation in the seedlings that I had strong suspicions that perhaps the insects had cross pollinated the flowers with another species altogether, in advance of my own careful efforts. Not long afterwards I was able to pay a visit to De Herdt's nursery and expected to see the batch of large, old, plants of Lau Gymnocalyciums which he used for producing seed. But there was no sign of them. In their place were a batch of plants with the same label but they were much younger and nothing like as large, which now formed his seed raising stock for these species. His old specimens had been disposed of, and replaced by some Y seedling plants, because as he said, they are more prolific with seed production. Not only that, he was apparently now on to Y x Y plants, all of which looked very much like peas out of a pod. So I came to the conclusion that my own H x H cross had really produced the same sort of variation that would be found in the population in the wild.

.....from H.Middleditch

We are all used to the F1, F2 and so on coding for hybrid generations so a Y1, Y2 and so on may not be out of place.

RAINED OFF THE CACTI From J.Watson

A few years ago I was able to come to your Chileans Weekend and show you several slides of cacti which I had come across in the course of my expedition to the southern Andes. Not far from the Paso Pino Hachado we had found some plants which occasioned much surprise when we showed the slide. You told me that they looked like a species of Neoporteria, I believe, which had not been expected to occur this far south. We were back at this self-same site in December 1992 on a cold, wet, misty and miserable day, when we found these same cacti were out in flower. To be more precise, the flowers would have been open if it had been a better day, but they were closed up. A few photographs of some alpines were taken by A.Hoffmann, but no photographs were taken of these cacti, as we hoped to return on the following day. However, when we looked back to the mountains on the next morning, there was no improvement to be seen in the weather, so we decided reluctantly to continue on our travels. When we returned to this area some weeks later, to search for seed, there were no flowers on the cacti, and no fruit to be seen.

TEPHROCACTUS MANDRAGORUS

In making reference to this name in Chileans No.51 it was noted: "As Kiesling observes in his review of the Argentinian Tephrocacti (Lemaire), Backeberg did not deposit a type specimen when erecting this name, so that according to the then current ICBN Rules, this name is invalid." This presumes that the requirement for depositing a Type specimen predated the original publication of the name. Under the same heading of T.minutus, Kiesling also notes "Opuntia mandragora (Backbg) Rowley (comb. illegit.); Maihueniopsis mandragora (Backbg) Ritt (comb. illegit.)"; presumably these latter two are stated to be illegitimate names because the basic name of T.mandragora is regarded by Kiesling as invalid?

.....from R.Mottram

Frequently I do find myself referring to a summary of the main points of the ICBN prepared by Urs Eggli, in Bradleya 3. On that basis, as long as the latin diagnosis is given, then Tephrocactus mandragorus Bckbg in Cactus 38: 150.1953 is validly published. And on checking, this does appear to be the case. The requirement for a nomenclatural Type to be cited in the original publication is only required after 1.Jan.1958 (ICBN Article 37.1).

Lack of a Type is of course a handicap to subsequent authors, and this is exacerbated by the lack of a precise type locality. Later authors would therefore be justified in in rejecting the name as insufficiently known, but they could not do so on the grounds of invalidity. A later author may wish to designate a type, and he would look first for a herbarium specimen of the type collection, which we can be reasonably sure does not exist in this instance. He would then check if Backeberg published a good illustration, and indeed he publishes three photographs in his Die Cactaceae, of which the clearest is probably Abb.363 (p.349) and the new author would then designate this as the lectotype for the species. The plant in the illustration agrees well with the plants in cultivation under this name, so that is no problem.

If there was no illustration suitable for designation as lectotype, the writer would then search for, or prepare himself, a herbarium specimen which agreed in the essential features of the first description, and this he would call the neotype of the species i.e. the specimen on which the new author based the name, even though not of the type collection. Taking all the foregoing into account, Opuntia mandragora (Bckbg) Rowley and Maihueniopsis mandragora (Backbg) Ritter are both validly published.

.....from H.Middleditch

In Cactus 38.1953 there is indeed an entry under Tephrocactus mandragora Backbg spec. nov. which reads as follows: Radice longo et crasso, usque ad 12 cm x 3 cm, forma variante; articulis oblongis vel ovoides, ad 2 cm longis, apice attentuatis; aculeis tenuissimus, brevibus, 1-3, albidis, ad 5mm longis vel deficientibus; flore fructuque ignoto. Argentinia borealis. Whatever views may be held as to the suitability of this description, it would appear to be valid, as R.Mottram observes. The segments on my own specimen of T.mandragorus are well over 2 cm in length - perhaps a facet of cultivation?

ERIOSYCE - JOIN THE CLUB From R.Schultz

During the course of our trip to Chile we collected seed from E.aurata near Hurtado in the valley of the R.Limari, and of E.rodentiophila south of Taltal. We also collected quite a nice selection of Copiapoa seed. The Eriosyce germinated very quickly and grew vigorously, growing faster than all the Copiapoa for the first six weeks. They were healthy until about four months old when the first ones began to rot, so that I do not think that the seed was to blame or anything related to the compost or sowing. They appear to have rotted as a result of my watering programme. which is basically lots of water frequently. I still have several hundred seedlings, but was disappointed with how easily they rotted. By comparison, probably less than 1% of my Copiapoa seedlings have died in the course of eight months since they were sown.

My sowing system is not elaborate. My seeds get sown in large polystyrene trays on top of my standard unsterilised potting mix, watered heavily, covered with a plastic sheet and ignored for three weeks. Then I have a look at them and lift the plastic sheet a few inches. Over the following couple of months they will be sprayed with a fungicide once or twice. The plastic is removed after about ten weeks and the seedling trays covered with a light shading material. Seed sowing is done in the Spring and no additional heating is used, but here in Australia my polythene covered greenhouse often reaches 30°C on sunny spring days. It is surprising how much heat seedlings can tolerate under plastic; I can recall a temperature inside the greenhouse of 55°C without any ill effects. At night the temperature inside the greenhouse can drop down to 12°C.

I was surprised to read what you say about pretreatment of seeds. The idea of force-germination of an immature embryo in cacti is a new idea to me, but I do not think it applies to the Eriosyce grown here.

.....from R.Ferryman

My own sowings of Eriosyce have been done in a propagator where they will have about 25°C during the day and about 12°C at night. Even though the top was removed from the propagator after the seeds germinated, they got up to about 38°C and five different species of Eriosyce were cooked - an almost total loss. Another batch of seeds were sown and this time the seedlings were taken out of the propagator and put into the open greenhouse very quickly after germination. There they can receive far better ventilation. The problems encountered by R. Schultz may possibly be avoided if the seedling tray is given ventilation after germination.

.....from H.Middleditch

One method of achieving this ventilation might be that adopted by C.Hall who, as reported earlier in these pages, fitted a small ex-computer fan into the top of his propagating enclosure, brought into operation by a reverse thermostat. This acted as an extractor fan and was intended to avoid excess build-up of heat in the propagator. It is also reminiscent of the earlier comment by A.W.Craig about freshly germinated Maihuenia seedlings - of lifting them well up to get them into moving air.

.....from R.Ferryman

Indeed it is quite possible that a satisfactory way of germinating Eriosyce may be to treat them the same way as alpines!

.....from R.Moreton

Germination of the seed we brought back from Chile has generally been good, although there were a few unexpected failures. In particular the Eriosyce sp. from Fray Jorge have given near 100% germination, very quickly as well. However, my own experience with Eriosyce is that the seedlings do not like being transplanted. They are quite happy in their seed pot and reach about the size of a pea in about three months from germination, so that they are quite fast growing at this stage. However, from past experience I know that if I prick them out into trays as I would do for most other species, then they will most likely die. A comment from K.Preston-Mafham suggested that Neoporteria do not like being moved in the summer and I think I would agree with that. So perhaps the answer is to leave my present sowing of Eriosyce where they are until next spring.

THE CARDENAS HERBARIUM From J.Iliff

A question which has been bothering me for some time, to which you may be able to provide an answer. Do you know the whereabouts of the Cardenas herbarium?

.....from H.Middleditch

On six or seven different occasions in the course of previous years' Chileans' Weekends we have been able to listen to accounts of visits to Bolivia and see slides that were taken there. My recollection from one or two of these accounts is of visits paid to the "Cardenas collection" in Cochabamba where an enclosure housed a number of growing plants. For some reason an impression has been gained that this was not a herbarium in the usually understood sense of the term i.e. a number of dried and mounted, or otherwise suitably conserved, specimens of the various plants collected by Cardenas or his assistants.

.....from J.Kirtley

When we were in Cochabamba we paid a visit to the Botanic Garden there, which is clearly marked on the map of the city. First of all we had a problem gaining entry to the Botanic Garden itself but eventually the gate was unlocked and we were allowed inside. Within this Garden, there is a fenced compound which we understood contained Cardenas' collection of plants. However, we were not able to find out how we could gain access to that separate section and we had to leave without seeing what it contained.

.....from B.Bates

It is quite possible that the Cardenas herbarium material will have been kept at the University where Cardenas was Rector - the St. Simon University I believe.

.....from W.Verheulpen

Received your query about the Cardenas herbarium material. Many Universities and Botanical Institutes are accessible on our Inter-net, but on-line facilities are few and far between in Bolivia and St Simon University is not one of the few.

.....from P.Bello

My information is that the Cardenas herbarium was dispersed. It may be possible to establish the situation from either Prof. Lara or Prof. Candia at Cochabamba University - they are both Cardenas' ex-alumini.

.....from J.D.Donald

When we were in Bolivia we paid a visit to the Botanic Garden in Cochabamba but we were unable to gain entry to the inner compound which contained the Cardenas collection. To judge by the plants growing inside the compound which we could see through the fencing, they were in a pretty poor condition, in fact it would not surprise me if many of them

were dead. However, the bulk of the Cardenas herbarium has been removed from Cochabamba to Argentina. It is quite probable that R.Kiesling may have more information about it.

.....from D.Metzing

During 1993 I was in Cochabamba in company with R.Kiesling when together we visited the Cardenas collection, which is in a separate compound within the Botanic Garden in Cochabamba. The Cardenas herbarium was kept in the building within the inner compound, where we looked at a number of the herbarium records. Naturally I was especially interested in the Gymnocalycium, making notes of those and taking photographs. However most of the Cardenas herbarium material is held at Instituto Lillo in Tucuman (LIL) and I believe that there are also some specimens in the USA, at the Smithsonian Institution.

FIELD NUMBER COMPENDIUM - THIRD SUPPLEMENT

It is the intention to produce a third supplement to The Chileans' Field Number Compendium which would contain some additional field number lists. It is currently planned to make this supplement available by Summer 1996. At this stage, the cost is not expected to exceed £5. Further details should be available in the New Year from the Membership Secretary.

THE CHILEANS 1996 WEEKEND

It is planned to hold this event over the weekend of 13-15 September 1996 at Nightingale Hall, Nottingham University Campus, when it is anticipated that we will be joined by a visiting speaker from Switzerland, who has travelled in Bolivia and Argentina. The cost per head for single room accommodation, all meals, use of lecture room and facilities, together with a pro-rata proportion of visiting speaker's expenses, will be £107.50 (or £102.45 if paid prior to 14 August). Bookings should be made directly with the Chileans' Treasurer and cheques should be made payable to "The Chileans".

REPORT AND ACCOUNTS - CHILEANS VOL.15 Nos. 49-51 inclusive.

RECEIPTS		EXPENDITURE	
Subscriptions	2481.00	Printing of Journals	2397.50
Back number Sales	876.20	Postage, Stationery, etc.	1189.86
Sale of other publications	605.00		
Sale of plants & seed	84.40		
	4046.60		3587.36
Miscellaneous Income	140.01		
Bank Interest	294.76		
	4481.37		
Two Chileans' Annual Weekends	5900.78	Nottingham University Charges for two Chileans' Weekends	5868.07
Balance brought forward from previous account	2905.34	Balance carried forward	3832.06
	13287.49		13287.49

From the above accounts it will be seen that a demand continues for back numbers, largely met from stock on hand. The space available for storage of these back numbers is limited. With the addition of each new issue the Membership Secretary has found that the bulk and weight of the boxed pages posed an increasing handling difficulty when collating back numbers. In order to ease this problem, a proportion of approximately half the back issues have been mechanically collated and bound. In this way meeting orders for back numbers has been made less of an onerous and difficult task. The cost of this collation was expended after the close of the above accounts and thus will appear against Volume 16.

The small notional profit on the two annual Weekends does not take into account any ancilliary costs such as postage, stationery, etc., nor of display material obtained specifically for these events. This ancilliary cost is included under the general heading of "Postage, Stationery,etc." and will be approaching three figures, appreciably in excess of the notional profit on the Weekend Events. Up to the time of writing, visits to possible alternative venues, some with similar charges, some with materially less charges, has not yielded a viable alternative to our present venue.

The word processor used almost exclusively for preparation of the text for The Chileans, for field number lists, and for notifications for The Chileans Weekend, has not yet been costed against the accounts. However, as it is now just over twenty years old and is showing signs of needing replacement, this charge can not be long delayed. The text for each issue of The Chileans is converted to IBM compatable by D.Aubrey-Jones which is then formatted to machine-ready masters by G.Charles; this has greatly facilitated the process of printing current issues of The Chileans. However, there have been rather lengthy delays on account of the tardy receipt of (literally) one or two materially useful contributions to an issue. Conversely, those enquiries which have not had to await germination, flowering or fruiting, and have received a reply in some two or three weeks, have greatly assisted preparation of reviews.

The Treasurer reports that significantly heavier bank charges now being imposed on payments received from overseas where these are not in £ sterling. In consequence the nett receipt is materially less than actual cost of the order. It has therefore become necessary to request overseas members to make any payments in £ sterling e.g. by Eurocheque or by International money order.

The Chileans' seedling list, produced by G.Charles, has been well received and attracted good orders. From the monies received from the sale of these seedlings, a very welcome amount of £152 has been donated to The Chileans' funds. This figure will appear in the accounts for Volume 16.

A great deal of valuable observations and comments have been received from an appreciable number of members and also from other correspondents. This is the backbone of The Chileans' Journal. Without this and many other forms of valuable support, all of which are greatly appreciated, it would be most difficult to continue with the publication of The Chileans as well as with other activities.

CONTENTS

Particular interests

Austrocactus	A.Johnston, 11 Malvern Rd., Scunthorpe DN17 1EL
Cereanae	G.J.Charles, Briars Bank, Fosters Bridge, Ketton, Stamford PE9 3UU
Cleistocactus	T.Lavender, Kalanchoe, Market Place, Tetney DN36 5NN
Copiapoa	A.W.Craig, 32 Forest Lane, Kirklevington, Yarm TS15 9LY
Discocactus	R.Moreton, 91 Umberslade Rd., Selly Oak, Birmingham, B29 7SB
Echinopsis	M.Muse, 32 Fielding Rd., Birstall, Leicester, LE4 3AJ
Frailea	C.Holland, Newling Farm, Litcham, Kings Lynn PE32 2PB
Lobivia	M.Lowry, 7 Bygot Close, Leconfield, Beverley HU17 7NN
Matucana	D.Aubrey-Jones, 62 Rosehill Park, Caversham, Reading RG4 8XF
Melocactus	J.Arnold, Suffolk House, 2 Oak Hill, Washingborough, LN4 1BA
Neoporterianae	R.M.Ferryman, Nichelia, The Street, Stonham Aspal IP14 6AH
Opuntia	R.Crook, 35 Cardinal Close, Worcester Park, Surrey KT4 7EH
Rebutia	M.O'Hara, 242 New Road, Booker, High Wycombe, HP12 4RG
Rhipsalis	A.Hill, 8 Vicarage Rd., Grenoside, Sheffield S30 3RG
Tephrocactus	R.K.Hughes, 16 Ashbourne Ave., Bootle L30 3SF

When contacting any of these members please enclose an s.a.e. in the first instance.

THE CHILEANS

Organiser	H.Middleditch, 5 Lyons Ave., Hetton-le-Hole DH5 OHS
Treasurer	R.L.Purves, 19 Brocks Drive, Guildford GU3 3ND
Membership Secretary and Back Numbers	Mrs.G.Craig, 32 Forest Lane, Kirklevington, Yarm TS15 9LY