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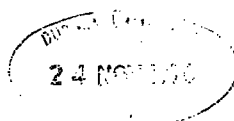
STUDIES IN THE GENUS GYMNOCALYCIUM

G. J. SWALES

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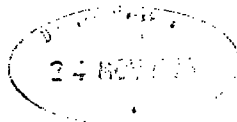
A Thesis submitted for the degree of
Master of Science
in the University of Durham

September 1975



Studies in the genus GYMNOCALYCIUM Pfeiffer

A critical survey of the literature, especially original descriptions, of two of the major groups within the genus; an attempt to define the distribution of these species as far as it is known; a tentative suggestion for a better regrouping of the species, and photographs, where available, of examples from these groups at present in cultivation in my reference collection.



ABSTRACT

During a preliminary survey of seed structure within the genus Gymnocalycium it became obvious that in the English language at least, there was no authoritative description of many of the plant species concerned. Consequently, a critical literature survey, with particular attention to the original descriptions has now been carried out for the 31 species of Gymnocalycium generally referred to the Macrosemineae and the Ovatisemineae, two of the original five seed groups of Frič and Kreuzinger. At the same time, the majority of the species concerned have been kept for a number of years in cultivation in the author's reference collection. The study of the living plants, combined with the results of the literature survey, has led to what is hoped to be a much clearer concept of the various species, and, as a prelude to further study, a tentative scheme is put forward showing possible inter-relationships and evolutionary trends within the combined groups.

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PROLOGUE

"First of all I had to familiarise myself with the literature of the subject, and then compare the plants that I had found in the country-side with the pictures in the books; then, when I found any similarity between them, I had to study the descriptions more closely. After a time, I acquired skill from practice; when I chanced upon some unknown plant, I first considered to what tribe and family it belonged or could be assigned ... so I first of all looked for it in the appropriate group, and in this way saved myself a great deal of trouble."

John Ray: *Catalogus Plantarum circa
Cantabrigiam nascentium*. 1660.
(Ewen & Prime's Translation 1975)

Introduction

Botanically, the Cactaceae is probably one of the most neglected families of flowering plants and yet it contains a wealth of interesting and unusual material, and even today, new taxa are still being added to its ranks.

My own interest in the family dates from over twenty years ago, and by the time my collection of plants had outgrown its original window-sill, it was already becoming obvious to me that relatively little was known about them. Reference books were hard to find and those few which were available often contradicted each other, and the position was obviously a most unsatisfactory one.

Of virtually no economic value, it is largely through the activities of commercial interests supplying the fluctuating demands of small numbers of amateur enthusiasts throughout the world over the past 150 years that our knowledge of these plants has gradually increased. Unfortunately, there are fashions in cactus collecting as in everything else and certain genera have, in the past, become popular and as a result have been heavily collected in habitat, only to be neglected later in favour of some other genus. In addition, large growing species unsuitable for greenhouse cultivation have been generally ignored. Thus our knowledge of the group tends to be somewhat fragmentary. Due to competition between commercial collectors in the field, habitat details are sometimes jealously guarded secrets and so our knowledge of distribution too, in many cases, is vague or almost non-existent. The taxonomy of the group has also suffered. Many amateurs uncritically tend to amass labels rather than plants, so that commercial suppliers find it difficult to resist the temptation to create new varieties and species on the flimsiest of evidence from amongst the admittedly often

very variable material which they receive from habitat. Consequently, from the taxonomic view-point, there is a great deal of work which needs to be done to place the whole system of nomenclature on a firm scientific footing.

As international trade got back to normal after the 1939-45 war, the supply of cactus plants available to the amateur increased greatly and in order to compromise with limited greenhouse space and expensive heating, many collectors began to specialise and in my own case, more by chance than anything else, I decided to concentrate on the genus Gymnocalycium. Very few, if any, of the species seemed to be regarded as rarities or difficult in cultivation and thus material was available at a reasonable price. As the size of the collection increased, so did my dissatisfaction with the nomenclature. If I remember correctly, it was Schütz's first article on the sub-division of the genus utilising the characteristics of the seeds, published in 1962, which finally stimulated me to take up the detailed study of the plants that I was collecting.

It appeared that Frič and Kreuzinger in 1935 had begun the process by a simple division into five groups, but although initially this served a useful purpose, with the increase in the number of known species, one group at least became increasingly unwieldy and was obviously heterogeneous in nature. Schütz developed the classification further but still more work was needed before a satisfactory division could be established, and only a few improvements resulted from his second publication in 1968. When I had pursued my study here described for nearly a year, Buxbaum in 1968, published his own revision of the seed classification. He made a number of the modifications I had intended to propose, but also left several anomalies which in my opinion needed further study.

By this time, it had become apparent to me that one of the major problems was getting seed which was reliably named, for much confusion had been caused by wrongly named or hybrid seed. In addition, it was found that, for certain species, there was considerable difference of opinion as to what the plants should really look like. The original descriptions in many cases were not easily available and the majority were in German, Spanish, Czech, French and Dutch journals, and though they included, for the most part, a diagnosis in Botanical Latin, many popular authors copied from secondary publications, and were not always reliable. Further complications arose from the fact that many so-called authorities who had written widely in various journals over the years were in fact, collectors of plants rather than students of Botany, and although they were most knowledgeable in some respects, they were sometimes sadly ignorant in others.

In fairness to the amateurs, however, it must be recorded that the professionals were not entirely blameless. For example, it is said of Spegazzini, whose name is connected with almost every aspect of Argentinian botany, not only the study of the Cactaceae, that he "generally made notes on the spot or from the plants cultivated in his house from flower pots without labels. His memory was not always so reliable as to recollect the name itself and the place of origin of each specimen. ... Spegazzini did not preserve at all the specimens of the Cactaceae used in his studies, which in several cases created synonyms of his own species or amplified geographical distributions with analogous species all attributed to one alone through mistaken determination on the ground." (Castellanos, writing in the American Cactus & Succulent Journal, 1940.)

Over and above these problems, one has to contend with the large numbers of European grown plants, often of very doubtful parentage, which in recent years have flooded the market in response to the increasing interest taken by the general public in Cacti as house plants. Plants imported from habitat are relatively rare, expensive and often mis-named and the origins sometimes suppressed for commercial reasons, so that short of actual field trips to the habitat, the European based student often has great difficulty in determining the correct identity of the plant with which he is dealing. Cacti, by their very nature, do not lend themselves to herbarium preservation and material in this country appears to be sadly limited. Kew Herbarium for example, was able to offer only four sheets of *Gymnocalycium*, only one of which possessed flowers, while the British Museum (Natural History) had only a single sheet.

The result of all this has been to re-direct my efforts, for the time being, to the study of the literature, its translation, and the compilation of comprehensive surveys of each individual species, in the course of which virtually all references have been followed up and consulted in the original rather than relying on the quotations of later authors. As far as I am aware, this has never been done in English and was long overdue. Because of the extremely time-consuming nature of the work, I have been forced to restrict myself, in the first instance, to only two of the five seed groups of Frič and Kreuzinger, namely the *Macrosemineae* and the *Ovatisemineae*. According to Buxbaum, the most primitive members of the genus, with their large black seeds, and yellow flowers, belong to the first of these groups, so that it was an obvious one with which to begin the study. The *Ovatisemineae* were chosen as the second group because they, too, had fairly large seeds

which were black and at least one species within the group also had yellow flowers. This flower colour is not found anywhere else in the genus. Further justification for choosing these two groups came to light as the work progressed and it now appears highly probable that the two groups are best regarded as one.

Although much of interest has come out of the study so far, it is essential that the literature survey for the remainder of the species be completed before attempting to proceed further with a taxonomic study of the whole genus. The suggestions put forward in the last section of this work are purely tentative and well may have to be modified when the genus is looked at as a whole. It is my belief that previous studies have often been hampered by a lack of reliable material and a clear idea of the nature of the plants under investigation.

The species, varieties, and forms which are listed in this study are very much as they appear in the literature and only in very few cases have changes been made by the present author. It seems at this stage, that varieties are far too numerous and even some species appear to be superfluous but these have not been altered. Only when the emphasis of the study has been directed onto the living plant, can such modifications perhaps be justified.

Genus: Gymnocalycium Pfeiffer

Dr. L. Pfeiffer, Abbildung und Beschreibung Blühender
Cacteen, Volume 2, in text following
Plate 1, 1845.

Gymnocalycium nov. gen. Calycis tubus ovario adhaerens, carnosus, elongatus, nudus, squamis paucis inermibus, semilunaribus, distantibus instructus. Sepala extima linearia sensim in petala biserialia, obovata, mucronata abeuntia. Stamina et stylus Echinopsidis. ~~Fru~~^{Fruct}ices globosi, ovati vel columnares, costati vel tuberculati. Bacca ovata, parce squamosa, perigonio coronata.

Species notae: G. denudatum (Echinocactus) Link & Otto,
G. gibbosum (Cactus) Haworth,
G. reductum (Cactus) Link.

The diagnosis translates as follows:-

The calyx tube adhering to the ovary, fleshy, elongated, naked, and bearing a few, widely separated, half-moon shaped scales, lacking spines. Outermost sepals linear, gradually giving rise to two series of obovate mucronate petals. Stamens and style Echinopsis-like.

Globose shrubs, ovate or columnar, ribbed or tuberculate. Flowers arising from the plant apex, opening for 1 - 2 days, whitish, scented.

Berry ovate, sparsely scaly, bearing the perianth (remains) at the top.

Pfeiffer, in the text following plate 12 of the same work, states that "In the catalogue of Cacti of Mr. Schelhas^e in 1843 and 1844, I proposed the combination of Echinocactus denudatus, gibbosus and Cereus reductus to form a new genus that I called Gymnocalycium. Nevertheless I had not introduced this genus to Science." The present author has so far failed to trace copies of these catalogues, but in any case, when Britton & Rose (1922) revived the genus, they mentioned the catalogues in a foot-note but said "we do not

credit (them) as place of publication" and it would seem to be generally accepted that 1845 is the date of publication of Pfeiffer's new genus.

In the early days, when the number of known species belonging to the family Cactaceae was relatively small, few if any authorities saw the need for a separate genus so defined and continued to place these plants in the large genus Echinocactus. When Britton & Rose (1922) reintroduced the genus, they listed twenty-three species, but even then it was by no means universally accepted and was ignored by the more conservative European botanists of the day.

Britton & Rose define the genus as follows:- "Plants globular, simple or caespitose, strongly ribbed; ribs divided into tubercles often protruding at the base; flowers campanulate to short-funnelform, from upper and normally nascent areoles, usually large for size of plant, white, pink, or rarely yellow; flower tube bearing broad scales, these with naked axils; fruit oblong, red so far as is known, scaly; seeds cap-shaped or dome-shaped, brownish, tuberculate."

All the plants involved came from South America, east of the Andes, chiefly from Argentina but also from Bolivia, Paraguay, Uruguay and, although not mentioned in the introduction by Britton & Rose, Southern Brazil. This omission is rather strange considering that the type species for the genus (G. denudatum) comes from that area. Another significant omission is the absence of red from the list of flower colours. Although G. baldianum had been described by Spegazzini in 1905 as having "petals of a beautiful deep red", for some reason Britton & Rose ignored the colour of the flowers and the name appears in their book only as a synonym of G. platense.

Their introduction continues:- "The tubercles on the ribs have an enlargement more or less conspicuous just below the spine-areole which Schumann calls a 'chin'. So far as our observation goes, this is present in all the species, although it is very small in G. saglione, and it may be of considerable diagnostic importance. By this character plants belonging to species of Gymnocalycium can be referred generically when not in flower.

The flower in this genus, as in other genera of this tribe, normally comes from the centre of the plant, borne on nascent areoles; but sometimes, especially in greenhouse plants, the flowers of some are lateral and borne on old areoles ...". Some authors have used this feature to separate a sub-group within the genus but in the present author's experience, although some species do tend to bear their flowers more towards the edges of the plant body, this feature is very variable and can be much influenced by growing conditions, any check to growth resulting in flowers emerging at or near the centre, while vigorous vegetative growth tends to push new areoles much further out towards the periphery before they are mature enough to produce blooms, and particularly when dealing with cultivated plants growing in far from ideal conditions, this feature is most unreliable.

By the time Backeberg came to write his *Die Cactaceae* (1959) the number of named species had increased to more than seventy and more than eighty were listed in his *Kakteenlexikon* (1965).

Backeberg describes the genus as follows:- "Plants spherical, or to some extent elongated in old age, solitary or off-setting, sometimes producing large clumps; ribs well defined, of varying height, more or less strongly tubercled; flowers short bell-shaped to more or less bell-shaped above a more slender ovary, or funnel shaped, of various lengths,

the lip of the flower shorter or longer; the ovary or tube with moderately broad scales having no spines in their axils; flowers usually of considerable size, white, pink, red or more or less yellow; the fruit is more or less elongated to moderately long, strong walled, splitting longitudinally; seeds variable in shape and colour, brown to black, moderately small to relatively very large, to some extent having a conspicuous hilum rim."

Hunt (1967) has enlarged the scope of the genus by including within it other genera such as Neowerdermannia and Weingartia but this has met with little approval and seems to have been dictated more by taxonomic convenience than the affinities of the plants concerned, and the present author considers the genus in the older and narrower sense. Consequently Hunt's diagnosis of the genus as he understands it is omitted.

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(No page numbers)
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and ROSE, J.N.,
- 1959 BACKEBERG, C., Die Cactaceae, Volume 3, p.1695.
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Volume 2, p.461.

The sub-division of the genus Gymnocalycium
by means of seed characteristics

Frič and Kreuzinger (1935) suggested a division of the genus into five groups on the basis of the seeds. The present author has not been able to consult the original text but it would appear from other authors that the groups were named as follows:- Macrosemineae, Ovatisemineae, Trichosemineae, Muscosemineae, and Microsemineae.

Schütz (1962) retained these names in his first publication dealing with the classification of the genus Gymnocalycium. In his later revision (1968) however, he re-defines each group, renaming the first group of Frič and Kreuzinger and giving each the status of a sub-genus. He defines the various groups as follows:-

1. Macrosemineae:- (Now known as Subgenus Gymnocalycium)

Fruit and berry, green when ripe, opening by means of a slit or the breaking down of the ovary wall. Seeds large, 1 - 3 mm long, hemispherical, somewhat compressed, dilated near the aril. Testa black semi-matt, elongated hilum, somewhat depressed. The aril around the hilum light or dark.

Note: Schütz appears to use the term "aril" for what others might prefer to call a strophiole while the aril proper is referred to merely as "a brownish integument" in the following group.

2. Ovatisemineae:- (Subgenus Ovatisemineum)

Fruit a berry, splitting open vertically when ripe. Seeds up to 1 mm long, spherical, cut across in the region of the aril. Testa black, dull, partly or totally covered in a brownish integument. Hilum almost circular, bordered with a very small aril.

3. Microsemineae:- (Subgenus Microsemineum)

Fruit a berry, opening when ripe by means of vertical or horizontal fissures. Seeds small, less than 1 mm in diameter.

4. Trichomosemineae:- (Subgenus Trichomosemineum)

Plants flattened, solitary, to 15 cm in diameter. Fruit a berry, club-shaped, opening by a vertical fissure when ripe. Seeds to 1 mm diameter, hemispherical, laterally compressed, with dilated aril. Testa varying from pale to dark brown, extremely shiny. Hilum elliptical, aril high around the hilum, for the most part pale in colour.

5. Muscosemineae:- (Subgenus Muscosemineum)

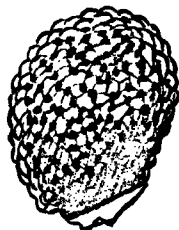
Plants diverse in form and size. Fruit a berry, club-shaped, opening by a vertical fissure when mature. Seeds to 1 mm diameter spherical. Testa pale brown, dull, as if dusty. Hilum small, thin and not easily seen (?). (The German version translates - "aril but little prominent").

Investigation of the seeds belonging to plants within the five groups would seem to indicate that the Trichomosemineae and the Muscosemineae are clearly defined groups, but the Microsemineae is a large heterogeneous group of very doubtful validity. As a result of the present study, the remaining two groups, originally thought to be distinct, would also appear to be best considered for the moment, as one single group, while further detailed seed studies could well indicate relationships with the Microsemineae. At the present time, this last possibility is only hypothetical, but as the work progresses, the status of some, if not all, the old groups becomes less and less clear and the seed groupings may have to be abandoned altogether.

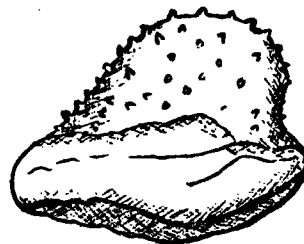
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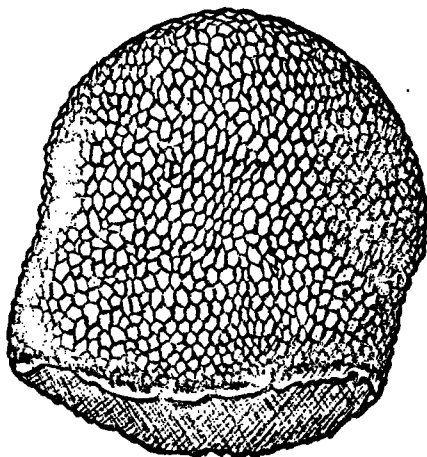
GYMNOCALYCIUM
SEEDS



MICROSEMINEAE



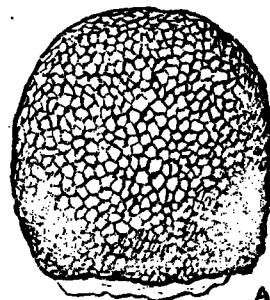
TRICHOSEMINEAE



MACROSEMINEAE

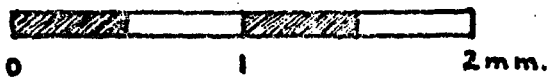


MUSOSEMINEAE



A.K.B

OVATISEMINEAE



Groups 1 & 2 of Frič & Kreuzinger,
namely the Macrosemineae and the Ovatisemineae

The detailed accounts of plants which follow are arranged in eleven groups; ten lettered A to J respectively, each containing species considered to be closely related, and an eleventh, un-lettered, accommodating two plants, one of uncertain affinities and the other whose very existence is doubtful.

Group A

1. G. leeanum
2. G. netrelianum

In some respects this group is a difficult one to sustain, the tendency being to assume a close-knit relationship between all of the yellow flowered Uruguayan *Gymnocalycium*s, and Frank (1969) states:-

"From its seed structure, G. uruguayense is closely related to the form-group (formen-kreis) G. leeanum/netrelianum." Later in the same article he continues "... it must also be noted that an undoubted relationship exists, with regard to the seed types, linking G. uruguayense to the variable form group around G. denudatum with which it is contiguous in the northern extremity of its (i.e. G. uruguayense's) distribution." Later (1970a) Frank modifies his views somewhat and referring only to the yellow flowering Uruguayan *Gymnocalycium*s, makes the rather puzzling statement

"... seen from the purely botanical point of view, one can really speak of only one valid species, to which the oldest name G. leeanum must be applied. From the practical point of view however, I find it convenient to accept two species, which are recognisable as two well differentiated types. Geographically they may also in general terms ... be divided into the more northerly and the more southerly groups." The present author takes what is hoped to be both a botanical and also a practical point of view in separating G. leeanum and G. netrelianum from the rest, as they appear to differ in the number and strength of spines from the other yellow flowered species and provide a possible link with G. hyptiacanthum and G. schroederianum as well as, more obviously, with the remaining Uruguayan plants. Donald (1970b)

while agreeing with the idea of the two groups of yellow flowered plants, maintains that G. schroederianum is "easily recognisable and distinct from the other 'uruguayenses' ... it should stand as a species in its own right ..." and if he acknowledges any link between it and the southerly group of G. leeanum and G. netrelianum, he does not mention it.

Whether or not G. leeanum and G. netrelianum may be considered a single species is not at present an issue. This, together with the possible synonymy of the remaining Uruguayan plants under a single species name can surely only be decided by actual field studies and is not strictly relevant to the present work where it is primarily relationships which are in question.

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GYMNOCALYCIUM LEEANUM (Hooker) Britton & Rose

Britton & Rose; The Cactaceae, Volume 3, p.154. 1922.

Synonymy:

ECHINOCACTUS LEEANUM Hooker, Curtis 's Botanical Magazine,
Volume 71, plate 4184, 1845.

Diagnosis:

Echinocactus Leeanus; depresso - globosus obscure subglaucous -
viridis tuberculis subhemisphaericis majusculis obtuse hexahedris
mammiformibus confluentibus, in series irregulares subverticales
dispositis, areolis ovalibus tomentosis, aculeis subgracilibus
quorum subdecem patentibus rectiusculis cum unico centrali porrecta
vix majore, floribus majusculis pallide flavescentibus. (Hooker 1845).

Varieties:

- (1) var. BREVISPINUM Backeberg and Knuth, Kaktus ABC, p.291. 1935
but without Latin diagnosis). Diagnosis given in Backeberg,
Die Cactaceae, Volume 3, p.1736. 1959.

Diagnosis:

Differt a typo aculeis radiantibus, satis brevibus, rectis,
in apice brevissimis. (Backeberg 1959).

- (2) var. ROSEIFLORUM Y.Ito, Explanatory Diagrams of Austroechinocactanae,
p.292. 1957.

Diagnosis:

Applanato - globosum, 2.5 - 3 cm crassum; nitido saturatoviride;
costis ca. 13, in tuberculis magnimamillaribus; aculeis flaccidis
marginalibus ca. 7, effusis, complexis, primum albo-luteis deinde
sordidis, flore rotata albo-rosea. (Ito 1957).

NOTES:

- (a) The second varietal name is considered by some to be an error and should refer to G. uruguayense (which see).
- (b) Backeberg & Knuth, (Kaktus ABC, p.290, 1935) make a new combination reducing G. netrelianum to a variety of G. leeanum. The present author prefers to retain G. netrelianum as a separate species for the time being until more is known about these plants from field collections.
- The first description of this plant was published by Hooker (1845) based on cultivated plants grown by Messrs. Lee of the Hammersmith Nursery, London, from habitat collected seed sent to them from Buenos Aires, Argentina, by Mr. John Tweedie in 1840. Between that time and the publication of Britton & Rose's work on the Cactaceae, little appears to have been written about the plant, Schumann (1898) merely mentioning it as a synonym of E. hyptiacanthus. The present author fully supports Britton & Rose (1922) in their objection to this synonymy on the grounds that E. hyptiacanthus, amongst other features, has a white flower and no central spines while E. leeanus has centrals and a yellow flower. In addition, the fact that Schumann gives the wrong date (with a query) for the reference to Curtis's illustration of E. leeanus must surely indicate a lack of knowledge of the picture concerned. Britton & Rose could find no record of the re-discovery of the species, but mentioned J.A. Schafer's plant No.123, collected at Salto in Uruguay on March 7th, 1917, which flowered in the New York Botanic Garden in 1918, as possibly being this species. In Kew Herbarium however, there is material collected by N.E. Brown under the name of E. leeanus Hooker inscribed "Buenos Aires, May 13th, 1875". The flower and plant body would seem to match the original description fairly

closely although the radial spines number eight only and they vary somewhat in length both above and below the size quoted by Hooker, namely approximately $\frac{1}{2}$ ". Whether Buenos Aires refers to the city or the state to which the city gives its name, is not made clear.

Backeberg (1959) gives virtually the same description of the plant as do Britton & Rose, then goes on to describe as problematical the three species G. leeanum, netrelianum, and hyptiacanthum. In the present author's opinion the last named is quite distinct, but the other two are indeed somewhat difficult to separate. Backeberg makes G. netrelianum only a variety of G. leeanum but for the moment it would seem best to keep them as separate entities, as species in their own right, until such time as a wider range of habitat collected material becomes available, when a more informed judgement may be made.

Backeberg also mentions G. leeanum var. brevispinum. This plant was first recorded in his Kaktus ABC (1935) but only later given a Latin diagnosis in Die Cactaceae (1959). Unfortunately he does not illustrate G. leeanum itself, only the variety, so that comparisons may not be made. Moser (1972) illustrates a quite different plant under the same varietal name so that the position remains, for the present, a most confused one.

G. leeanum var. roseiflorum Y.Ito is thought by Backeberg to be an error, probably referring to a variety of G. uruguayense

Description: (Verbatim from Hooker (1945))

A small species, globose but depressed at the top. Tubercles which compose the surface rather large, hemispherical, mammilliform*, but having about six very obtuse angles, of a rather glaucous dark* green colour, not

* These two words are the only additions to Hooker's description in English and come from the Latin diagnosis.

arranged in distinct lines or series so as to form ridges with their corresponding furrows, but placed with a good deal of irregularity, becoming, below especially, confluent and obsolete, at the top small and very numerous. Areolae oval, downy, or rather woolly, producing about eleven rather slender spines, of which one, the central one, stands forward and is quite straight; the other ten are slightly recurved, and spread horizontally (especially on the older tubercles), most of these are nearly equal in size and about half an inch long. Flowers from the summit or depressed portion above, one or two, moderately large. Tube short covered with green roundish or oblong obtuse scales, the upper ones larger, with pale edges and tips and gradually passing into the pale sulphur or almost cream-coloured petals.

G. leeanum (Hooker) Britton & Rose variety brevispinum Backeberg.

(Latin diagnosis and German comments).

The plant differs from the type species in that the spines stand out, spreading, not appressed, moderately short and curved. They are very short in the region of the growing point.

G. leeanum (Hooker) Britton & Rose variety roseiflorum Y.Ito

(Latin diagnosis only).

Plant body flattened spherical, 2.5 - 3.0 cm in diameter, deep shining green, with about 13 ribs bearing large mammilliform tubercles. Radial spines 7 in number approximately, flexible, spreading, embracing (appressed ? G.J.S.), at first pale yellow, later dingy looking. Flower wheel-shaped (rotate), pale pink.

Habitat:

Habitat details of this plant should be accepted with some degree of caution in that their validity depends on the correct identification of

the plants concerned and considering the general uncertainty in the minds of many authors, correct identification is not at all easy and it well may be that the information given here will have to be modified if and when reliable collected material becomes available for study.

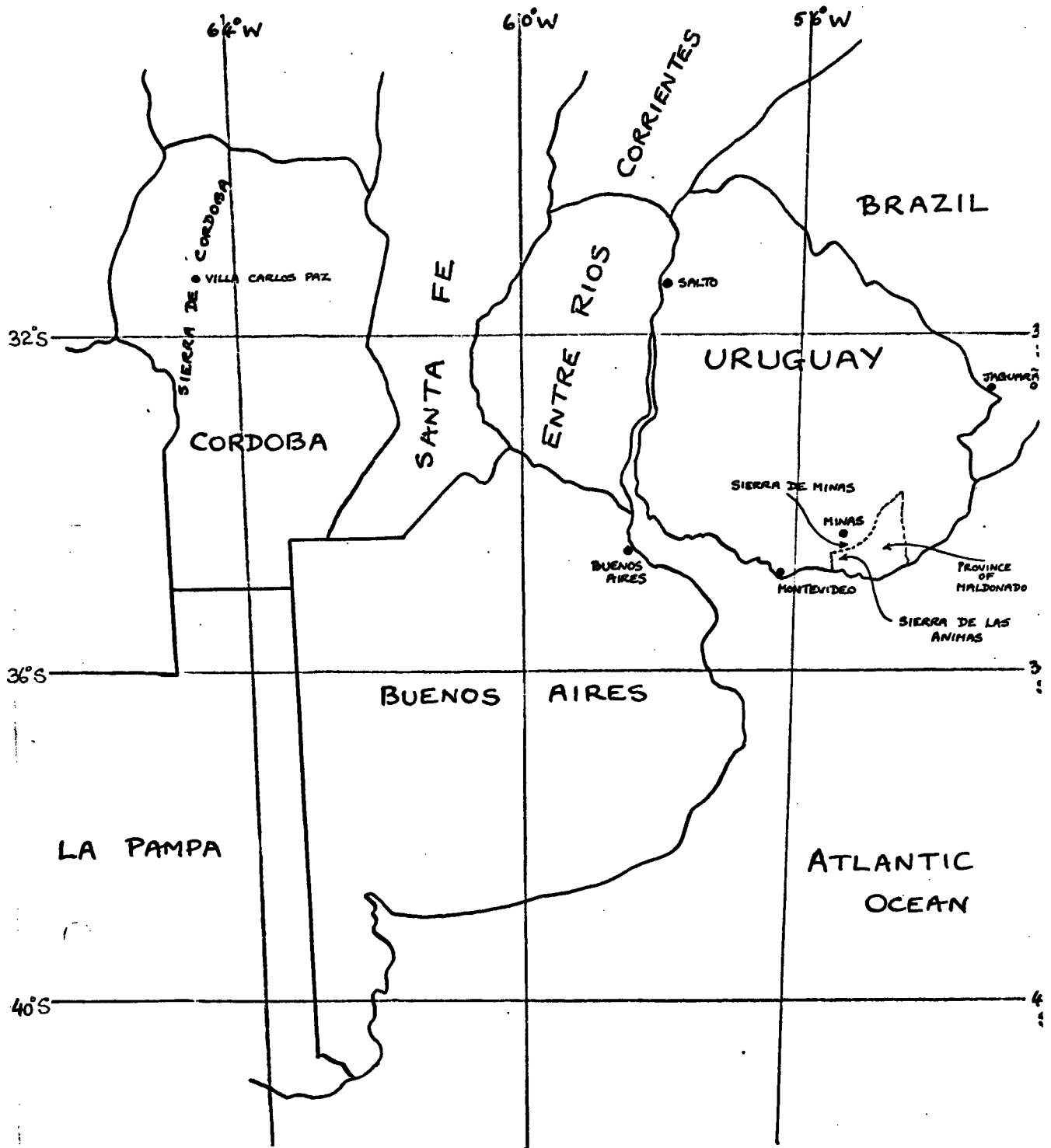
Hooker (1845) gave the plant's habitat as the "Argentine provinces" while N. E. Brown (1875) labelled his herbarium material "Buenos Aires" without specifying whether he intended the city or the province of that name. Britton and Rose (1922) extended the range to Argentina and Uruguay, presumably on the assumption that Schafer's plant No.123 from Salto, Uruguay, was in fact this species. Backeberg (1959) confirms the Uruguayan source by quoting Herter who repeats Salto, Uruguay. Frič is reported to have found this plant in the Sierra de las Animas during his expedition of 1927/28 while Buining (1968) reports it from the Sierra de Minas only a short distance to the north of that locality. This was probably the material later made available in Europe under the number HU 296 although there appeared to be some doubt as to whether this was G.leeaanum or G. netrelianum. Villa Carlos Paz in the Sierra de Cordoba, Argentina was also given as a habitat for G. leeanum (1971), and if this is correct, it extends the distribution area greatly in a westerly direction. The habitat of G. leeanum var. brevispinum is given by Backeberg (1959) as Maldonado, Uruguay. The province of this name includes within its boundaries, the Sierra de las Animas but not the nearby Sierra de Minas while other areas of higher ground also occur there.

Map references:

BUENOS AIRES (City)	58° 27' W	34° 36' S
SALTO (City)	57° 58' W	31° 23' S
SIERRA DE LAS ANIMAS	55° 20' W	34° 41' S
SIERRA DE MINAS) Alternative SIERRA DIVISORIA) names	55° 20' W	34° 31' S
VILLA CARLOS PAZ	64° 30' W	31° 25' S
MALDONADO (City)	54° 58' W	34° 54' S

Note: Buenos Aires, Salto and Maldonado are all situated in provinces of the same name.

Sheets H 20 Cordoba - Fanta Fe
H 21 Uruguayana
I 21 Buenos Aires - Montevideo



Eastern Provinces of Argentina, Uruguay & S. Brazil.

Reported distribution of G. LEANUM.

(Scale: 1" = 105 miles)

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GYMNOCALYCIUM NETRELIANUM (Monville) Britton & Rose

Britton & Rose, The Cactaceae, Volume 3, p.154. 1922

Synonymy:

ECHINOCACTUS NETRELIANUS Monville, In Labouret, Monographie des Cactées, p.248. 1858.

GYMNOCALYCIUM LEEANUM var. NETRELIANUM (Monville) Backeberg. Backeberg & Knuth, Kaktus ABC, p.290. 1935.

Earliest available description:

Tige globuleuse, peu ombiliquée, vert subcinérascent; 14 côtes arrondies, peu saillantes; sillons profonds dans la partie supérieure de la plante, disparaissant dans sa partie inférieure; côtes tuberculeuses- aréoles insérées aux sommets des tubercules, rondes, munies de tomentum blanc jaunâtre, nues plus tard; aiguillons mous insérés à la partie inférieure des aréoles, 5 - 7 tortillés, inégaux, très adprimés, les 2 supérieurs (qui manquent parfois) sont plus courts, l'inférieur plus fin est encore plus court; tous fauves à la base, gris sale à la pointe. (Labouret, 1858).

Varieties:

Var. CITRIFLORUM (Frič ?) nomen nudum.

A superfluous name according to Backeberg (1959) but occasionally met with in catalogues, etc.

Note: Y. Ito (1957) apparently supports Backeberg in making this species a variety of G. leeanum, but on the other hand, still retains "G. netrelianum" as a species! As the relevant text is in Japanese, this matter has not been pursued further.

The earliest description of this plant within the genus Echinocactus would appear to be that of Labouret (1858) although the author credited with the name is Monville. The country of origin was not known to Labouret but he seemed quite familiar with the plant in cultivation. Later, Rümpler (1885) still lacking information regarding its origins, repeated the previous description almost word for word. He gives the plant the alternative name of "Netrel's Igel-cactus" (Netrel's Hedgehog Cactus) but the present author has no information regarding this person at present. He is listed by Schumann (1898) in his author-list but no information is offered about him. The same author suggests Uruguay or Argentina as the natural habitat of the plant and gives a somewhat more detailed description of it, but again essentially the same as the original in the main facts. There is, however, a discrepancy between the number of ribs quoted in the Latin diagnosis (14) and the number quoted in the German account (8 - 10). The former number agrees with that given by the previous authors. Britton and Rose (1922) transferred the plant to the genus Gymnocalycium and described it briefly. The spines are now said to be "brownish" rather than fawn at the base, greyish at the tip in the mature state, and yellowish with a red base when young, as described by Schumann. A type locality is not given but Schumann's suggestion that the plant might possibly come from Argentina or Uruguay is repeated with the added information that neither Arechavaleta nor Spegazzini mentions such a plant from Uruguay or Argentina respectively. Britton & Rose state that in Dr. Weber's opinion, this species closely resembles E. hyptiacanthus but is much smaller and the flowers are yellow not white. Borg (1951) repeats the statement that the spines are brownish and gives Argentina as the country

of origin. Backeberg (1959), dealing with this plant as a variety of G. leeanum, repeats the description of Britton & Rose and then gives the country of origin as Uruguay. He also points out the change in spine colour introduced by Britton & Rose, and rejects it in favour of Schumann's original description. Backeberg attributes to Förster the opinion that orange coloured spines also occur, but on reference to the text (1885) one finds only the statement that "all are orange at the base, grey at the tip", a statement that accords well with that of Schumann.

G. netrelianum variety citriflorum (Frič ?) nomen nudum is listed by Backeberg as a superfluous name and finally reference is made to the rather strange situation where Y. Ito (1957) repeats Backeberg's combination, making G. netrelianum a variety of G. leeanum but also, in addition, retains "G. netrelianum" as a separate species.

Frič in 1927/28 was supposed to have collected this species in S. Uruguay and presumably brought it to Europe, while in more recent years Buining & Horst (1968) collected material in Uruguay under the number HU 296, which came to Europe as "leeanum or netrelianum", but it is not known whether a final identification was actually made. Schatzl (1969) reported that plants under Rausch No. 350/2 and 350/3 were received at the Linz Botanic Gardens and had dark green, depressed-spherical bodies, with 10 - 12 ribs depending on the size of the plants, roundish areoles with white wool, later becoming grey, in the crown. There were 6 - 9 radial spines, reddish at the base, curved and appressed. Central spines were absent. He assumed that the plants "must be G. leeanum var. netrelianum". Whether or not this is the case depends on the range of variability one is prepared to accept within the limits of a single species but under the circumstances it is, perhaps, a reasonable assumption.

Description:

The description which follows is based on that of Schumann (1898) which is more detailed than that of the original by Labouret (1858) but which in no way contradicts or conflicts with it.

Body simple, later proliferating abundantly, small, flattened globular, scarcely in excess of 3 cm in height and slightly under 3 cm in diameter. Rounded above, with depressed apex which is tubercled but completely bare and lacking spines. Body dark green, later brownish. Ribs 14 separated by long angular grooves at the top but becoming confluent at the base, divided up into tubercles by cross-furrows. Tubercles with a waxy bloom, projecting only slightly, and bearing "chins" only in the upper region of the plant. Lower down they are more cone-shaped. Areoles rounded, at the top of the tubercle, at first having some sparse yellowish-white wool-felt but later becoming bare. Spines 5 - 7 arising from the lower edge of the areole, somewhat crumpled, appressed, slender, very flexible, soft and almost bristle-like, unequal in size, the laterals the larger, up to 9 mm in length, the two upper ones occasionally missing. All are at first yellowish, red at the base, but later grey with yellowish bases. Central spines absent.

Flowering from the vicinity of the apex, flowers measuring 3.5 cm in overall length. Ovary green, spherical, bearing semi-circular rounded green scales without wool or spines. Perianth broadly funnel-shaped. Tube short, similarly scaly, these changing gradually from spatulate and blunt to serrated-edged with spine-like point. They become the perianth segments above, these being lemon yellow with a silky lustre, and having a green mid-stripe. The stamens are half as long as the perianth, filaments white, anthers yellow. The white style is longer than the stamens with bent-over stigmatic lobes.

Habitat:

Because of the uncertainty as to what exactly is understood to be G. netrelianum, and the lack of habitat details in the earlier descriptions, it is difficult and indeed rather pointless at this stage to try to be at all precise. Buining (1968) collected material under the number HU 296 from the Sierra de Minas which might have been this species while Frič is said to have collected the plant from the Sierra de las Animas during his expedition of 1927/28. Map references for these two areas are given under G. leeanum, and also a sketch map.

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Group B

1. G. artigas
2. G. melanocarpum
3. G. guerkeanum
4. G. uruguayense

For comments on this group, see notes under Group A.

GYMNOCALYCIUM ARTIGAS Herter

Dr. G. Herter, Revista Sudamericana de Botanica,
Volume 10, pp. 1 & 2. 1951

Diagnosis:

Corpus juventute subglobosum, postea obconicum vel subcylindricum, valde depressum, diam. 6 - 8 cm, alt. 2 - 3 cm (partibus subterraneis sub-rapiformibus exclusis), laete obscure viride (non glaucum nec griseo-viride). Costae primum 6 - 8, postea ad 10, majusculae, glabrae, tuberculis distinctis, semiglobosis vel mammosis seu obtuse hexaedricis, subconfluentibus, in series verticales subirregulariter dispositis. Aculei 3 - 5, rariter 6, radiantes vel subpectinati, setosi, subduri vel flexiles, non pungentes, corpori adpressi, inaequales, 1 - 2 cm long. Plantae monoicae. Flores majusculi, singuli vel plures, saepius terni vel quaterni, C. 5 cm long. et lat. Tepala externa squamiformia, viridia, medio rufo-vittata, minora C. 5 x 5 mm, paulatim in tepala interna, majora, lucida, citrina, 6 - 8 mm lat., 3 - 4 cm long. transeuntia. Stigmata nivea, in plantis masculinis unitae, in femineis patentes. Antherae vitellinae. (Herter 1951).

Gymnocalycium artigas was first described by Dr. Guillermo Herter (1951) following a preliminary discussion of some of the features of the plant in an earlier article by him (1950) dealing mainly with Sexual Dimorphism in this and related species of Uruguayan cacti. In his opinion it was a plant new to Science and he was supported in this by Herr Krainz of the Zürich Botanic Gardens.

The specific ^{epitit} name has apparently no geographical connotations in spite of there being a number of features bearing this name on the map of Uruguay. In fact, it commemorates General Gervasio Artigas, founder of the Uruguayan

nation, and the plant originates as much as 290 Km from the town of Artigas.

Unfortunately Dr. Herter does not provide illustrations of the plant but refers to an article by Müller-Melchers (1947) wherein a photograph purporting to be G. uruguayense in habitat, is claimed to show, in fact, G. artigas. If this is indeed the case, then a further locality for the plant must be added, namely Paso Valegas.

In recent years, many plants bearing the name G. artigas have been distributed through commercial channels, the majority probably not representing the species as Herter understood it. Seed from the Horst-Uebelmann expedition under collector's number HU 28 has been listed in the literature as G. artigas but also as G. uruguayense and even G. denudatum. In the present author's own collection, both plants under this number are white flowered and closely resemble plants of G. denudatum illustrated by Osten (1941). Seed collected by Rausch under collector's number R 350 has been circulated under the name G. uruguayense, but Schatzl, of the Linz Botanic Garden (1969) states that plants collected under this number correspond with G. artigas. It could well be that the confusion is due largely to the generally accepted fact that G. uruguayense and G. artigas are at least very similar, if not in fact identical.

Further confusion arises from the publication of a photograph, presumably by Buining (1968) in an article on Brazilian Cacti, of a "Notocactus artigas". A query follows the name beside the picture but there appears to be no reference to it in the text, which being in the Czech language, has not yet been translated. If this plant was found in Brazil (Rio Grande do Sul) and it really is Gymnocalycium artigas, as it could well be, then

the stated distribution of this plant needs to be greatly extended beyond the limits previously known. This is the only possible reference, at present to hand, to G. artigas (or G. uruguayense for that matter) occurring in Brazil and while it does not seem unreasonable, further substantiation is necessary before its correctness can be assumed.

Description:

This description is based entirely on the Latin diagnosis of Herter (1951):-

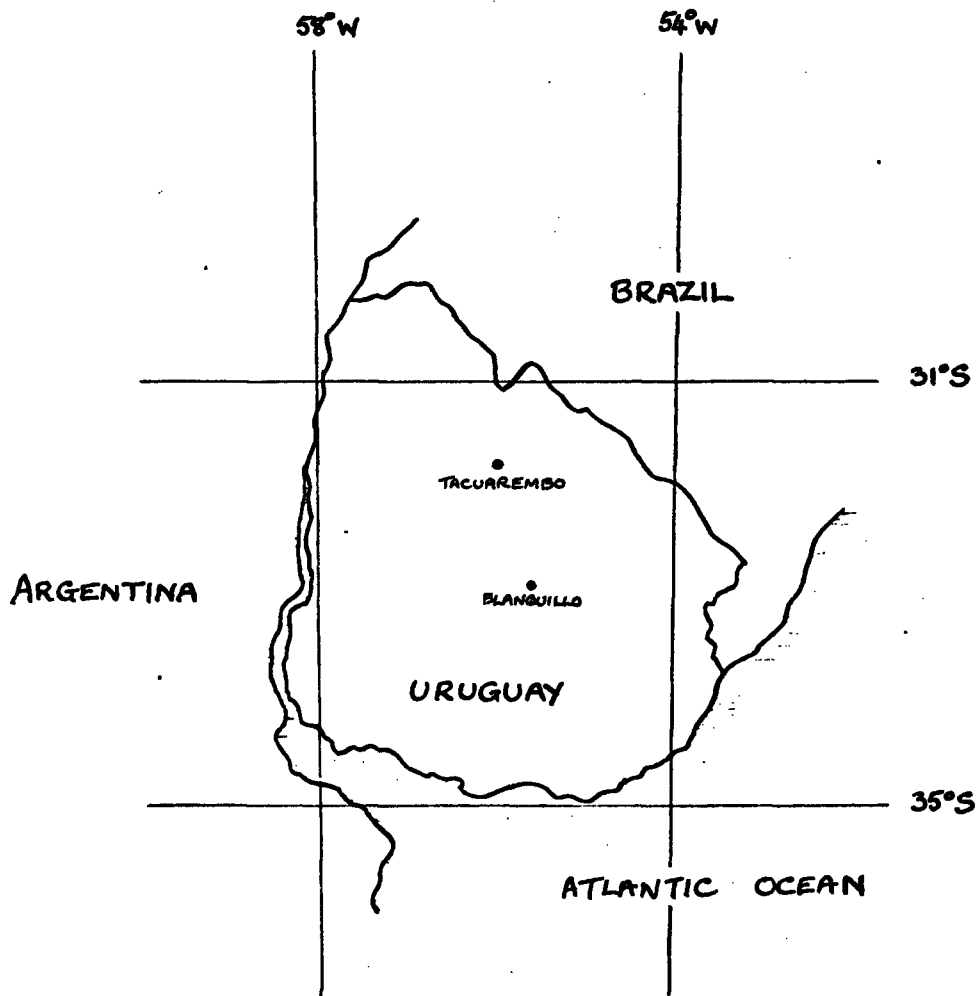
Plant body flattened globose when young, later inverted cone-shaped or almost cylindrical, markedly sunken at the centre, diameter 6 - 8 cm, 2 - 3 cm in height (not including the almost carrot-like subterranean portion) bright dark green (not dull or grey-green). Ribs at first 6 - 8, later up to 10, somewhat larger, smooth, with separate tubercles which are hemispherical or mammillate, or bluntly six-sided, somewhat confluent, arranged in vertical series, somewhat irregularly. Spines 3 - 5, rarely 6, radially arranged or almost pectinate, moderately hard, or flexible, not piercing, appressed to the body, of unequal lengths, 1 - 2 cm long. Plants monoecious. (The original is quite clear in stating "Plantae monoicae" but it seems quite clear from Herter's previous publication (1950) that this is an error. He states:- "As the male and female flowers are produced on different plants, it is also possible to speak of male and female plants.") Flowers moderately large, solitary or several, often 3 or 4 together, about 5 cm tall and 5 cm broad. Tepals on the outside scale-like, green with reddish mid-stripe, small, about 5 x 5 mm changing gradually to the inner tepals which are larger, bright lemon yellow 6 - 8 mm wide, 3 - 4 cm long. Stigma lobes white, united in the male plants, outspread in the female. Anthers egg-yellow.

Herter then goes on to point out that G. leeanum (Hooker 1845) Britton & Rose (1922) and G. netrelianum (Monville 1853) Britton & Rose (1922) differ from the above plant in their glaucous or grey-green colour, G. leeanum by its 11 spines and outwardly pointing centrals and by its pale yellowish or creamy-coloured flowers, and from G. netrelianum because of the latter's globular plant body with very slender spines.

Recent authors have added little to the above original description, Backeberg (1959) and (1965) obviously basing his own description directly on that of Herter.

Habitat:

Near Blanquillo, Department of Durazno, Uruguay, growing in stony placed, 150 metres above sea-level. If the photograph published by Müller-Melchers is indeed G. artigas (see above) than Paso Valegas must also be recorded as a source of this plant. Unfortunately the present author has not so far been able to trace this locality on a map but Müller-Melchers (1947) describes it as "further south" from Tacuarembó, although here again, Tacuarembó could be the town or the Department bearing the same name which covers a considerable area. It should be noted that Dr. Herter's locality can also be described as "south of Tacuarembó" so that in fact, the two places could be very close or even the same. Backeberg (1959) assumes Tacuarembó itself as a locality for G. artigas on the basis of Müller-Melcher's statement (1947) that "G. uruguayense" occurs there. I consider this an unjustified assumption in the absence of photographs or collected material, especially as G. uruguayense proper is reported by various authors from this area.



Uruguay and parts of Argentina & Brazil.

Distribution of G. ARTIGAS.

(Scale: 1" = 105 n.m.)

Map references:

BLANQUILLO	55° 37' W	32° 53' S
PASO VALEGAS	?	?
TACUAREMBO	56° 03' W	31° 40' S

Sheets H 21 Uruguayana and I 21 Buenos Aires - Montevideo

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GYMNOCALYCIUM MELANOCARPUM (Arechavaleta) Britton & Rose

Britton & Rose, The Cactaceae, Volume 3, p.161. 1922

Synonymy:

ECHINOCACTUS MELANOCARPUS Arechavaleta, Flora Uruguay, Tomo 2.

In Anales del Museo Nacional de Montevideo, Vol.5, pp.220, 221. 1905.

Diagnosis:

Simplex, globosus, vertice umbilicatus, tuberculatus inermis, costis 15, in tubercula angulata, sub spiraliter disposita cinerea viridia solutis; aculeis 10 - 12 radiantibus, centralibus 0 juveniles flavis, inferne rubellis; ovario obscuro squamoso glabro.

(Arechavaleta 1905).

Varieties:

None recorded to date.

This plant was first described by Arechavaleta (1905) as a species of Echinocactus. The illustration accompanying the description shows a plant bearing a single fruit and one is forced to the conclusion that this was the only material available to him as no details of the flower are given. Britton & Rose (1922) transferred the plant to the genus Gymnocalycium and their brief description, while omitting some of Arechavaleta's details, adds that the diameter of the plant varies from 7 - 9 cm and that the ribs are "broad and rounded". Backeberg (1959) alters the diameter back to the original 8 - 9 cm but retains the additional broad and rounded description of the ribs. In all other respects his description is virtually the same as that of Arechavaleta. In his Kakteenlexikon (1965) Backeberg makes no further changes or additions. Backeberg (1959) reports that Herter had published in 1954 a sketch of a

longitudinal section of a flower, lacking a well developed tube, having the cavity of the ovary spherical and the flower continuously spreading from the base. The scales were spatula-shaped, moderately closely arranged, over-lapping each other. The plant body was shown to have 5 spines per areole whereas Arechavaleta had stated 5 - 6 on either side, i.e. 10 - 12 in total. However, close examination of Arechavaleta's own photograph, even allowing for the poor quality of the copy available, does not give the impression of there being more than about 7 spines per areole.

Herter apparently did not say how the details of the flower were obtained and gave no information regarding flower colour, as Backeberg later only assumes the colour to be yellow because the general appearance of the plant body resembles that of other better known yellow flowered Uruguayan *Gymnocalyciums*. It would seem doubtful if either Britton & Rose or Backeberg actually saw and handled specimens of this species. In the latter part of 1968 Buining & Horst (1968) collected plants, later distributed under the collector's number HU 288A, which were thought to be, but not definitely identified as, *Gymnocalycium melanocarpum*. These were obtained in the vicinity of the Cerro Porton, near Paysandu, the habitat of Arechavaleta's plant but unlike the original which grew in "the clayey soils of Paysandu", Buining's plants grew in "a quite large bare and flat rocky place". The present author has so far been unable to trace the publication by Osten giving the habitat of *G. melanocarpum* as the Cerro Porton, quoted by Buining, but the latter author wrongly attributes the original description of the plant in question to Osten and obviously further investigation is required here. Donald (1970) has some of the HU 288A material in cultivation and believes there is little justification for specific status and he would rather it be regarded as a synonym of

G. uruguayense. It must be remembered however that this makes the assumption that the collected material is indeed the same as Arechavaleta's original plant.

Description:

The following description is based entirely upon Arechavaleta's original publication of 1905.

An olive green Echinocactus, the plant body nearly spherical, 7 - 8 cm high by 8 - 9 cm in diameter, the apex depressed and tuberculate, but the tubercles lacking spines. There are 15 ribs which are broken up into tubercles. These are angular at the base, arranged somewhat spirally, ashy-grey-green (this from the Latin diagnosis but compare the Spanish "olive green" !) and bear a hump beneath the areole. The grooves between the ribs are sinuous or serpentine owing to the hexagonal shape of the tubercle bases. The areoles are elongated, the older ones bare, the younger ones tomentose with whitish wool. The radial spines are arranged in two rows like the legs of a spider, 5 or 6 on either side, appressed, the largest 2 - 2.5 cm in length, the old ones dark in colour with greyish bloom, the younger ones pale yellow with a reddish base. There are no centrals. Flowers appear on the edge of the central depression in October and November and fruits in January. The ovary is dark green, scaly and glabrous. The scales are short and broad with pale membranous margins. Berry egg-shaped, about 2 cm in height by 1.5 - 2 cm in diameter, dark olive green, glossy, with insulating (? G.J.S.) bracteoles which are broad, with their margins whitish; the fruit is topped with the remains of the dead flower.

The plant resembles to some extent E. monvillei and E. uruguayensis but differs from them, not only because of the dark colouration but because of the arrangement of the spines, similar to E. pulcherrimus and E. hyptiacanthus.

Note: Of the four species of Echinocactus mentioned by Arechavaleta in the above paragraph, E. pulcherrimus is now placed in the genus Frailea, while the remainder are placed in the genus Gymnocalycium.

Habitat:

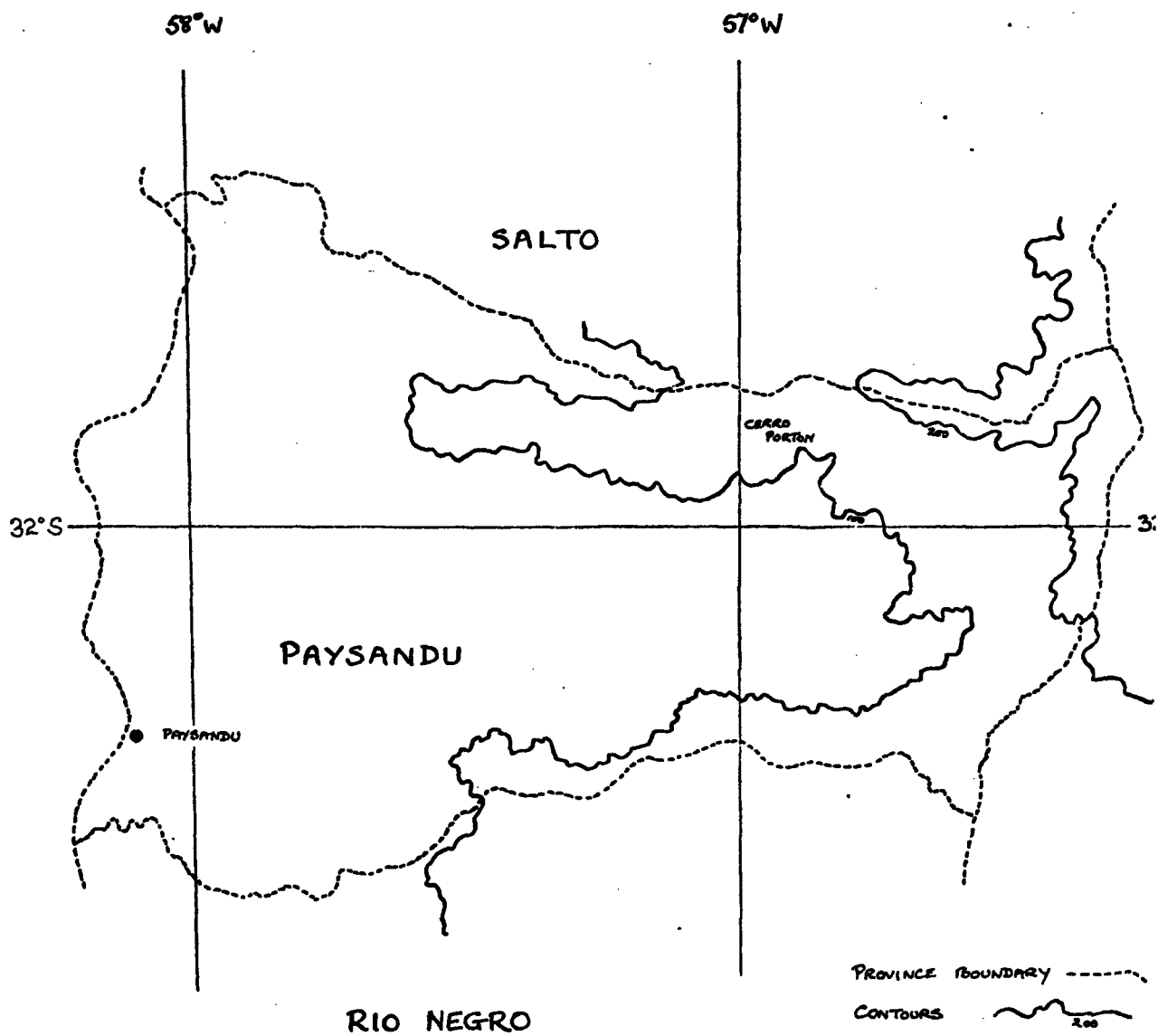
Details of the occurrence of this plant in habitat are unfortunately very few. Arechavaleta (1905) says:- "It lives in the clayey soils of Paysandu". Britton & Rose (1922) give the type locality as "Near Paysandu, Uruguay" but extend the distribution to Northwestern Uruguay, but on what evidence we are not told. Backeberg (1959) and (1965) merely repeats Paysandu, Uruguay. Buining (1968) quotes Osten as giving the Cerro Porton as the origin of this plant and did himself collect HU 288A in that locality, assuming that these plants were indeed G. melanocarpum as Arechavaleta originally understood it.

Map References:

CERRO PORTON	56° 55' W	31° 52' S
PAYSANDU	58° 05' W	32° 19' S

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- | | | |
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The Province of Paysandu, Uruguay.

showing 100m & 200m contours.

The Distribution of G. MELANOCARPUM.

(Scale: 1" = 16kms)

GYMNOCALYCIUM GUERKEANUM (Heese) Britton & Rose

Britton & Rose, The Cactaceae, Volume 3, p.154. 1922.

Synonymy:

ECHINOCACTUS DENUDATUS var BOLIVIENSIS Guerke & Heese, nom. prov.

ECHINOCACTUS GUERKEANUS Heese, Monatsschrift für Kakteenkunde,
Volume 21, No.9, pp.132 - 133. 1911.

Diagnosis:

Nanus, depresso-globosus, simplex, dein proliferans, vertice
tuberculis inermis, costis 9, tuberculis glaucis, aculeis 5,
radiantibus, centralibus 0, floribus flavis, ovaris squamoso
et glabro. (Heese 1911).

A specimen of this plant was first sent to Europe by Fiebrig in 1904 amongst a consignment of Cacti reputedly collected in Bolivia. They were received at the Royal Botanical Museum at Berlin - Dahlem by the then Director, Professor Guerke and studied in conjunction with Herr E. Heese, a gardener at the same institution. The particular plant in question looked superficially like some forms of Echinocactus denudatus and they provisionally named it E. denudatus variety boliviensis. It was not until 1910 that the plant, still in Hesse's possession, eventually flowered, producing a yellow bloom. Because of the flower colour, Heese (1911) considered it to be a species in its own right and abandoning the idea of it being a variety of E. denudatus, named it Echinocactus guerkeanus after his superior who had died earlier that year. Britton & Rose (1922) transferred the species to the genus Gymnocalycium and stated "we know it only from descriptions and illustrations". In spite of this they claimed that "the inner perianth segments are narrowly oblong, acute,

sometimes toothed", but in the original description the petals are described merely as "spatulate" and there is no mention of a toothed edge. It would be interesting to know on what they based this statement. It would perhaps be the illustration in Blühende Kakteen Volume 3, plate 144 which they mention but so far it has been impossible to check this by direct reference. Although a reproduction of this drawing accompanies Britton & Rose's text, it is somewhat indistinct. This same illustration shows a plant taller than it is broad in contradiction to Heese who gives the dimensions as 5 cm in diameter by 3.5 cm in height. However, this could well be a correct representation of the normal plant on its own roots (as opposed to Heese's grafted specimen) as the photograph in W. Haage's book (1963) shows a plant of similar habit. Britton & Rose (1922) also give the country of origin as Bolivia. Borg (1951) adds nothing new in his brief description and Bolivia is again quoted as the country of origin. Backeberg (1959) remarks on the resemblance of the plant to G. denudatum and then gives Heese's description almost word for word, but omitting to mention the second laterally disposed pair of spines, up to 12 mm in length, and the short greenish scales of the lower flower tube become longish green scales. He also omits reference to the anther colour mentioned by Heese. Bolivia is still retained as the country of origin. In his Kakteenlexikon (1965) nothing new is added. (No authority for the identification was given.) Dr. Simo (1967) referring to the plants reputed to be G. guerkeanum in his own collection and also in the Linz Botanic Gardens, which were collected in 1965, gives a description very close to that of Heese. In addition, he points out that the areoles are initially circular but elongate later becoming strongly felted. Old mature areoles however, later become bare of felt.

The plant body is dull green to bluish-green and the epidermis conspicuously granular. He stresses the "strongly pointed scales" on the flower tube and the pointed petals. The original description describes the former as "ovate" and the latter as "spatulate", but perhaps these are only trivial differences. Dr. Simo mentions the ovary "deeply seated in the areole", while the stamens (presumably the filaments G.J.S.) are said to be tinged with pale red. The plants exhibit "pseudohermaphroditism" i.e. only the sex organs of one gender being functional in any particular plant, the organs of the other gender being somewhat reduced in size and sterile. Heese does not mention the fruit of his plant. Dr. Simo describes that of his plants as "scaly, not hirsute, not very fleshy and seems to shrivel fairly soon. The flesh of the fruit is pink, the seeds are black." Seed and/or plants have been brought into Europe fairly recently under the collector's number HU 60 (possibly Dr. Simo's plants are from this source) and a Ritter collection number, FR 819 for the year 1959 has been seen in the literature (1972) under the name G. guerkeanum, but it has also been said to be synonymous with G. hamatum, a nomen nudum attributable to at least two completely different plants in addition to G. guerkeanum! (See under G. hamatum).

Description:

The following description is based entirely on that of Heese (1911) partly from the very brief Latin diagnosis, partly from the remainder of the German text.

Plant body dwarf, flattened globular, simple, later proliferating (N.B. Heese's specimen was grafted so that this is not necessarily a natural occurrence. G.J.S.), dull dark green in colour. Plant measuring scarcely 5 cm in diameter and scarcely 3.5 cm in height after some

seven years in cultivation. Ribs nine in number, drawn out into somewhat chin-like tubercles, glaucous. The plant apex is sunken, lacks spines and bears very scanty wool. Areoles about 8 mm apart, elliptical, 2 - 3 mm long with yellowish wool felt, later becoming bare. Spines all radial, consistently five, two smaller directed laterally and upwards about 5 mm in length, spread apart; two larger directed laterally and downwards, up to 12 mm in length, and one at the bottom directed downwards about 10 mm long, at first somewhat outstanding; later, as with the lateral spines, lying close to the body and each of the lower spines more or less the same. All spines rough, yellowish, reddish brown at the base. The flowers are borne on the apex of the plant, up to 5 cm long and about 4 cm wide. Ovary greenish, glabrous, bearing similar ovate scales. Flower tube funnel-shaped, the lower throat region covered with short greenish scales giving way above to longer spathulate, very glossy bright yellow perianth segments at the top, which on the outer surface bear a darker mid-stripe. Stamens numerous, half the length of the perianth segments. Pistil deep in the centre with nine lobes. Anthers bright Naples yellow, filaments pale bright green.

Habitat:

The original plant was said to have been collected by Fiebrig in Bolivia, and this country has been quoted in all the major accounts of the plant until after 1965, the date of the publication of Backeberg's *Kakteenlexikon*. However, the correctness of this is now suspect as it has become obvious in recent years that all the other known yellow-flowered *Gymnocalyciums* of similar appearance to *G. guerkeanum* came from Uruguay or the immediate vicinity. Commercial collectors as well as Professor Cardenas of the University of Cochabamba, have failed to find any yellow-flowered

plants of this group inside Bolivia, although of course it should not be entirely assumed that they do not exist there, as many areas away from main roads, railways, etc. could well remain unsearched. It is interesting to note in passing, how many type localities are situated on main roads, railways and the immediate vicinity of an air-field! This is of course inevitable in country which at best is difficult of access and sometimes completely inaccessible for certain periods of the year. However, it does seem rather unlikely that just one member of a fairly well-defined group should become so completely isolated and separated from the remainder. The plants referred to by Dr. Simo were found on the borders of Uruguay and Brazil at a place given by the collector as "Quaranyo". One is faced here with the problem of Spanish, Portuguese and local Indian variations in pronunciation and spelling as well as phonetic renderings of place names by Europeans. However, it seems fairly clear that the town of Jaguarao on the river Yaguaron is the place in question. The plants were collected on the left bank of the river which here forms the border, and are thus technically Brazilian in origin (Rio Grande do Sul). The present author has so far found only one other reference to the collection of this plant from habitat. It is reported that Frič in his expedition of 1927/1928 found G. guerkeanum in the Sierra de Las Animas, east of Montevideo, Uruguay.

Map References:

SIERRA DE LAS ANIMAS	55° 20' W	34° 41' S
JAGUARÃO	53° 21' W	32° 21' S

Sheets:

I 21 Buenos Aires - Montevideo
 I 22 Lagõa Mirim.

(For sketch map see under G. leeanum)

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GYMNOCALYCIUM URUGUAYENSE (Arechavaleta) Britton & Rose

Britton & Rose, The Cactaceae, Volume 3, p.162. 1922.

Synonymy:

ECHINOCACTUS URUGUAYENSIS Arechavaleta, Flora Uruguay, Tomo 2, pp. 218 - 220. In the Anales del Museo Nacional de Montevideo, Volume 5, 1905.

Diagnosis:

Globo, ahusado inferiormente, cara superior plana, umbilicada en su ápice. Paletas verticales, 12 - 14, formadas por mamilas hexaedras en su base ó sea separadas por líneas rectas; levantadas en la parte inferior ó debajo de las areolas en una prominencia bastante abultada, especie de jiba. Areolas orbiculares, tomentosas, tomento griseo, corto. Aguijones 3 ordinariamente, raramente más, de 1.5 - 2 cm de largo, tendidos, blanquecinos los antiguos, amarillentos los jóvenes, recubiertos por escamitas ó una especie de capa blanquecina rugosa. Flores sentadas en la vecindad del ápice, globosas antes de abrir, acampanadas, de 4 cm ⁺ de alto, por 5.5 - 6 de diámetro, desprovistas de vello, sino es en el pie que tiene un mechón de pelos cortos, blancos. Bractéolas inferiores ó sea las correspondientes al ovario, pequeñas, ovales, aisladas, verdosas, con el dorso moreno, las superiores lineares verdosas, con una línea media dorsal, obscura ó medio morena. Periantio, verde amarillento, pálido, exteriormente, blanquecino en su interior, pétalos linear-lanceolados, blancos, medio carnosos como las lacinias enumeradas. Androceo mitad más corto que el periantio; estambres numerosos, escalonados en la pared interna perigonial; filamentos pálidos; anteras pequeñas amarillentas. Estilo menor que el androceo; estigmas 8 - 10 verdosos.

Ovario verde, desnudo, de 4 mm ⁺ de largo. Fruto oblongo, comprimido lateralmente, estrechado inferiormente, con una que otra bractéola diminuta. (Arechavaleta 1905).

Variety:

var. ROSEIFLORUM Y. Ito. Explanatory Diagrams of Austroechino-cactaneae, p.293, 1957.

Diagnosis:

Parvum applanato - globosum vertice depressum; atro - viridi; costis ca. 12, rotundatis in tuberculis valdis humilibus magnimammillaribus; aculeis marginalibus ca. 7, effusis, intertextus, subadnatis, primum albo-atro-luteis postea opaco-fuscis; flore infundibuliformi 4 - 4.5 cm longa 6 - 7 cm lata, rosea vel albo-rosea. (Ito 1957).

Note: (a) Ito states at the end of his Latin diagnosis of this variety that it is probably the same plant as Frič had collected in 1928 and named (but not validly described) as variety rosea. Owing to this element of uncertainty, Frič's name does not appear as original author.

(b) Some authorities consider that Ito's G. leeanum var. roseiflorum although given a separate diagnosis and published at the same time as the above variety, is an error and should rightly belong here.

Form:

forma DEPRESSA Osten, Notas sobre Cactáceas, p.59. In Anales del Museo de Historia Natural de Montevideo, 1941.

Diagnosis:

Forma valde depressa, cormo disciformi, locis aridissimis enata. (Osten 1941).

(In view of the brevity of the Latin diagnosis, the more informative description in Spanish from the same publication is also included.)

Altura del cuerpo solamente $1\frac{1}{2}$ - 2 cms. Diámetro 6 - 7 cms.

Cuerpo verde oliva oscura, fuertemente achatado, muy hondamente umbilicado, opaco, poco reluciente; vértice con tubérculos inermes. Costillas 10 - 12, con 2 a 3 tubérculos armados en cada una. Los surcos son bastante pronunciados pero desaparecen casi en la parte inferior del cuerpo. Los aguijones nuevos son de color amarillento en estado joven, tornándose pronto grises y se hacen muy quebradizos, por lo que se ven muchas areolas casi inermes. Típicamente son 7 irradianes, faltando el central; están aplicados al cuerpo o con la punta alejándose de él, muchas veces arqueados, elásticos y apenas punzantes. "Dispuestos en forma de libélula": los 2 menores (10 mm), oblicuamente dirigidos hacia adelante, los cinco restantes mayores (hasta 20 mm) de los cuales 2 laterales, 2 oblicuos y el último mediano doblado hacia abajo.

Se distingue de la forma principal por las costillas en menor número y por el cuerpo aplanado. Recuerda algo al E. denudatus.

(Osten 1941).

Arechavaleta first described this plant (1905) as a new species of Echinocactus. Britton & Rose (1922) transferred it to the genus Gymnocalycium adding nothing except the statement that at least in their time, it was known only from the type locality. Frič is reported (1964) to have brought back examples from the type locality of Arechavaleta (who he knew personally) in 1928 together with other material which Frič named, but did not validly describe, as variety rosea. Osten (1941) writes of specimens of his own collecting and also describes a variant as forma depressa, the material in this case having been collected by his friend

Dr. Schroeder in 1922. Mueller-Melchers (1947) described finding the species in habitat and published a photograph, which was, however, disputed by Herter (1950) who claimed it to be G. artigas. Y Ito (1957) then published a valid description of Frič's variety rosea as variety roseiflorum. According to Backeberg (1959), Y. Ito's G. leeanum variety roseiflorum published at the same time, was either based on a hybrid or should more correctly belong here under G. uruguayense. Like most of the Uruguayan *Gymnocalycium*s, the identity of G. uruguayense has been much debated, and as is so often the case, there has been relatively little field-work upon which to base valid arguments. However, from time to time habitat collected material has reached Europe. In recent years Knize has collected at the type locality, Paso de los Toros, and distributed material under his number KZ 149, while Rausch, under R 350 (origin "Uruguay") has also sent collected material. Ritter some years ago also collected material distributed under FR 1374 while probably the most recent collection was in 1968 by Buining & Horst, who brought back material apparently under two numbers HU 93 and HU 93A. There appears to be some confusion but it seems likely that HU 93 produces pinkish flowers while HU 93A produces yellow ones. Both types were presumably collected in the Cuchilla de Haedo, South West of Tacuarembó. Recent authors, such as Valníček (1964) and Frank (1969 and 1970) have written in general terms on the problem of these Uruguayan plants but while contributing something, have not, in the present author's opinion, by any means settled the matter once and for all. The description of the species which follows is that of Arechavaleta alone (1905), more recent works, for the moment, being ignored.

Description: (From the Spanish, there being no Latin diagnosis).

Globular, tapering at the base, upper surface flattened, depressed at the apex. Ribs vertical, 12 - 14 in number, composed of tubercles with hexagonal bases, the ribs separated one from another by straight lines (grooves ? G.J.S.), raised into fairly large protuberances or lumps beneath the areoles. Areoles round, tomentose, wool scanty and grey in colour. Usually 3 spines, rarely more, about 1.5 - 2.0 cm long, appressed, the old ones whitish, the young ones yellow, covered with scales or a kind of whitish wrinkled coating. Flowers situated in the vicinity of the apex, globular before opening, bell-shaped, more or less 4.0 cm in height, 5.5 - 6.0 cm in diameter, lacking any wool except at the base, where there is a tuft of short white hair. Lower bracteoles - those associated with the ovary - small, oval, sheathing (?), greenish with brown back. The upper ones narrow, greenish with a medium brown or dark brown mid-stripe. Perianth greenish yellow, pale exteriorly; whitish on the inside. Petals linear - lanceolate, white moderately fleshy as are also the previously mentioned structures. The androecium is half the length of the perianth; stamens numerous, in ranks on the internal wall of the flower tube. Filaments pale, anthers small and yellow. Style shorter than the androecium, stigma lobes 8 - 10, greenish. Ovary green, hairless, about 4 mm long. Fruit oblong, flattened laterally narrowed at the base, bearing an occasional tiny bracteole. Flowering in November, they produce fruits during the following month. (Southern hemisphere G.J.S.).

G. URUGUAYENSE (Arech.) Britton & Rose, forma DEPRESSA Osten

Description based on both the brief Latin diagnosis and the more lengthy Spanish description:-

A strongly depressed form, originating from very dry areas. The plant body is disc-like, $1\frac{1}{2}$ - 2 cm in height and 6 - 7 cm in diameter. Body dark olive green, strongly flattened, very deeply depressed in the centre. The apex is dark, very slightly glossy, the tubercles lacking spines. Ribs 10 - 12 with two or three tubercles on each one. The furrows between the ribs rather pronounced but almost disappearing in the lower portions of the plant. The new spines are yellow at first quickly turning grey and they are very brittle, and as a result of this, many areoles are seen without spines. Typically there are seven spines and no centrals. They are appressed to the body or with the tip raised up from it, often arched, flexible and scarcely able to pierce. They are arranged in the form of a dragonfly. The two smaller (10 mm) are directed obliquely upwards. Of the five remaining larger ones (up to 20 mm), two are lateral, two oblique and the last median one, is directed downwards.

This form is distinguished mainly by the smaller number of ribs and the flattened body. Somewhat reminiscent of E. denudatus.

G. URUGUAYENSE (Arech) Britton & Rose, variety ROSEIFLORUM Y. Ito

Translation of the Latin diagnosis only:-

Small, flattened globose, growing point depressed; dark green, ribs about twelve, rounded, bearing strong tubercles with large low projections; marginal spines about seven, spread out, interwoven, almost adnate (appressed, surely ? G.J.S.), at first white - deep yellow, later dull brown; flowers funnel-shaped 4.0 - 4.5 cm long by 6.0 - 7.0 wide, pink, or whitish-pink.

Probably G. uruguayense var. rosea Frič, nomen nudum 1928.

Habitat:

Because of the uncertainty of identification, the following localities are listed as possible habitat areas but they may have to be amended

considerably in the event of reliable field data becoming available.

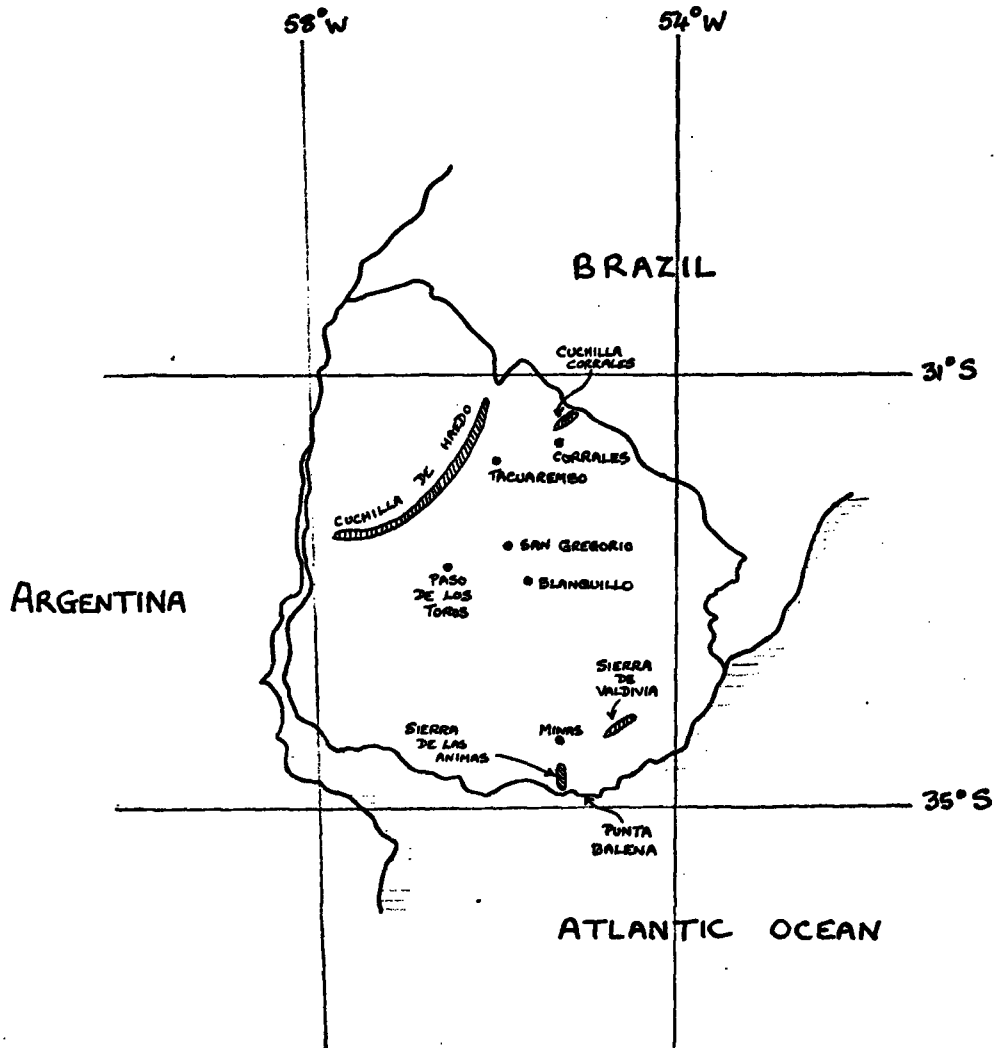
Arechavaleta (1905) obtained his plants from Paso de los Toros, in the province of Tacuarembó, an area of sandstone and modified basalt. Karel Knize in recent years has collected in this area also. Fric is said to have collected his variety rosea in the Sierra de las Animas, province of Maldonado in about the year 1928. Both Osten (1941) and Frank (1969) mentioned the area around Minas in the province of Lavalleja which appears to be granitic in nature. Osten's forma depressa (1941) originated from the extreme eastern end of the Sierra de Valdivia, just over the border in the province of Maldonado, again on granite. Mueller-Melchers (1947) reports the species from Paso Valegas (as yet unidentified but by implication, in the Cuchilla de Haedo, north-west of the town of Tacuarembó) and in the region of Tacuarembó itself in the province of the same name. Buining (1968) gathered material from the southern end of the Cuchilla de Haedo, south-west of the town of Tacuarembó en route for Paysandu. Rausch (1969) states that the species occurs all over Uruguay. Frank (1969) illustrates material collected from Punta Balena, province of Maldonado, and between Blanquillo and San Gregorio in the province of Durazno and yet further north from Minas de Corrales, province of Rivera, near the Brazilian border. All the above localities are within the borders of Uruguay.

Map References:

FUNTA BALENA	55° 02' W	34° 55' S
MINAS (Town)	55° 16' W	34° 23' S
BLANQUILLO	55° 37' W	32° 53' S
SAN GREGORIO	55° 52' W	32° 35' S
PASO DE LOS TOROS	56° 35' W	32° 45' S
SIERRA DE LAS ANIMAS	55° 20' W	34° 41' S
CORRALES (Minas de Corrales)	55° 23' W	31° 35' S
CUCHILLA CORRALES	55° 09' W	31° 21' S
SIERRA DE VALDIVIA	54° 37' W	34° 17' S
CUCHILLA DE HAEDO	56° 20' W	31° 42' S
TACUAREMBO (City)	56° 02' W	31° 40' S

Sheets: I 21 Buenos Aires - Montevideo

H 21 Uruguayana



Uruguay and parts of Argentina & Brazil.

Distribution of *G. URUGUAYENSE*.

(Scale: 1" = 105 miles)

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Volume 20, No.11, pp. 218 - 220.
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Volume 21, No.4, pp. 62 - 64.

Group C

1. G. hyptiacanthum^h
2. G. schroederianum
3. G. deeszianum

These three plants are placed together in one group because in the present author's opinion, they are closely related, and the first two could well be identical. (See comments under G. hyptiacanthum).

In terms of relationship with all the other species under consideration, they probably lie at a point close to where the old Macrosemineae and Ovatisemineae seed groups merge, and from where various lines of development arose as the genus developed and moved South, West, and North from Central or Southern Uruguay.

No reliably authenticated seed of G. hyptiacanthum is at present available for study but that of G. schroederianum appears to be intermediate between that of the Macrosemineae and the Ovatisemineae. In this context, G. deeszianum also has seed which is difficult to place. Although this latter plant comes, we are told, from Cordoba, Argentina, its spination differs from the neighbouring plants in that area, both in form and in that the colour is "... yellowish to whitish, more or less brownish at the base, occasionally with a darkish tip ..." which is reminiscent of G. hyptiacanthum and G. schroederianum. In addition to this, the flowers of both G. schroederianum and G. deeszianum have the unusual feature (for Gymnocalyciums) of the inner petals being mucronate and toothed. Yet again, Dolz describing G. deeszianum (1943) makes particular reference to the flower having a pink throat as opposed to violet or wine-red which is more commonly found, while Osten describing G. schroederianum (1941) says the throat of his flower

"is coloured a beautiful rose pink". Perhaps on further investigation of living material, G. deeszianum will have to be placed much nearer to G. schroederianum in the relationship diagram (see final section of this study) in contrast to where it stands at present due largely to geographical considerations.

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GYMNOCALYCIUM HYPTIACANTHUM (Lem.) Britton & Rose

Britton & Rose, The Cactaceae, Volume 3, p.156. 1922

Synonymy:

ECHINOCACTUS HYPTIACANTHUS Lemaire, Cactearum genera nova
speciesque novae, pp. 21 - 22. 1839.

CACTUS HYPTIACANTHUS Lemaire, In Steudel, Nom.Ed.2.
Volume 1, p.246. 1840.

ECHINOCACTUS MULTIFLORUS (Hort.) (non Hooker)
(Hildm.)

Note: The last synonym is doubtful and may have to be deleted
in the light of further investigations.

Diagnosis:

Oblongus, valde umbilicatus, saturate-viridis, undecies tuberculato-
costatus; sinubus repandis; tuberculis subhexaedris; areolis ovatis;
aculeis septem, inaequalibus, minimis, gracillimis, rigidiusculis, in
plantam plane incurvatis, aurato-luteis; quatuor bifariis, lateralibus.
(Lemaire1839).

Varieties:

Some modern authorities would recombine these as synonyms of the
type, while others prefer to keep them separate.

1. ECHINOCACTUS HYPTIACANTHUS var. ELEUTHERACANTHUS Monville.

Diagnosis: Variété dont les aiguillons sont moins adprimés contre
la plante, en quelque sorte libres par opposition avec la
disposition qu'ils ont dans notre plante type. (Labouret 1853).

2. ECHINOCACTUS HYPTIACANTHUS var. NITIDUS Monville

Diagnosis: Variété dont la tige est d'un vert plus luisant;
les aiguillons sont aussi plus colorés. (Labouret 1853).

3. ECHINOCACTUS HYPTIACANTHUS var. MEGALOTHELUS Monville

Diagnosis: Elle ne diffère que par ses tubercules plus forts;
aiguillons 7 et 1 supérieur très-petit. (Labouret 1853).

All the above three varieties in Labouret, Monographie des Cactées,
p.249. 1853.

They were transferred to the genus Gymnocalycium by Ito, in Explanatory
Diagrams of Austroechinocactanae, p.198. 1957.

GYMNOCALYCIUM HYPTIACANTHUM var. ELEUTHERACANTHUM (Monv.) Y. Ito.

" " var. NITIDUM (Monv.) Y. Ito.

" " var. MEGALOTHELIUM (Monv.) Y. Ito.

Note: G. PLATENSE var. HYPTIACANTHUM (Lem.) Backeberg, in Backeberg and
Knuth, Kactus ABC, p.294, 1935.

According to Backeberg himself in Die Cactaceae, Volume 3, p.1738, 1959,
this was an invalid recombination, but he gives no further information.

Echinocactus hyptiacanthus was first described by Lemaire (1839),
who concluded with the rather ambiguous statement that "the plant is
related to E. gibbosus but quite different", and who could give no
information regarding the country of origin, the flowers, or the fruit
and seeds. Writing eleven years later, Salm-Dyck (1850) begins his account
of the plant by repeating, word for word, the Latin diagnosis of Lemaire
but adds a further paragraph which is presumably original, although he
is also unable to describe the flower or state the country of origin.
Labouret's account (1858) seems to lack originality being derived very
largely from, and agreeing with, Lemaire and Salm-Dyck, and the country

of origin is still unknown. He does, however, add a little information about the flowers and also deals with the plant's cultivation in Europe. He also describes briefly three varieties, all of which are attributed to Monville, and which seem to be only trivial variations of the type.

When Schumann (1898) comes to describe this plant, it is said to have 5 - 8 radial spines, spreading, the lowest pair the largest, (up to 10 mm) and he says that occasionally a central spine occurs. Spine colour is described as whitish, brownish at the base, later becoming entirely greyish. He also quotes E. multiflorus Hildmann (non Hooker), which, so far, the present author has not been able to trace in the early literature, and E. leeanus Hooker, as synonyms of E. hyptiacanthus.

Hooker (1845) described E. leeanus as having "about eleven rather slender spines of which one, the central one, stands forward and is quite straight; the other ten are slightly recurved, and spread horizontally (especially on older tubercles), most of these are nearly equal in size and about half an inch long." Unfortunately he does not mention spine colour.

The discrepancies which appear as one compares these early descriptions of Lemaire, Salm-Dyck and Labouret with those of Hooker (E. leeanus) and Schumann and more recent authors, make a very careful assessment necessary, and it is no wonder that at the present time, many different plants appear in collections under this name, while the very existence of any such plant is denied by some authorities.

One feature of the more recent descriptions, with the possible exception of Borg (1951), is the lack of any reference to the lowest radial spine being the longest. The length of this spine is stressed

by the early writers and is shown most clearly in Gurke's illustration (fig. 70, p.403) to Schuman's description (1898). In the text, however, it is stated that the lowest pair of spines are the longest, not the median one. It would thus appear that Gurke had drawn the original type of plant while Schumann described something else.

Another feature of the more recent descriptions is the whitish colour of the spines and their brownish bases. Spine colour is often very variable within a species and thus unreliable as a point of identification, but in this instance, no colour range is given (which might include yellow), only "Whitish". The old descriptions mention only "golden" or "golden yellow" and include not only a purplish brown base but also a similarly coloured tip to the spines.

As a result of these differences, it does not appear unreasonable to assume the possibility of two species of plant having been merged under the one name.

If this is so, and it is the opinion of the present author that it is, then the problem remains as to the nature of the original type of plant and whether or not it is represented in collections today or even survives at all in habitat.

The genus Echinocactus in those early days was a very wide-ranging one, containing a wide variety of plants and there is a possibility that Lemaire's plant (especially in the absence of knowledge about its flowers) could today lie outside the limits of the modern concept of the genus Gymnocalycium. However, if we accept Labouret's statement that the flower tube was "scaly like E. monvilli" then we can restrict our search to within this genus and thus limit the number of possibilities.

In the experience of the present author, no species of Gymnocalycium appears to have yellow spines with both bases and tips of a purplish brown colour, but there is at least one species, G. schroederianum, which shows clearly the other feature, namely a long median radial spine reaching down to the next nearest areole. Two small seedlings in the reference collection, though not identical, already show this long median spine, which, hardly longer than the other radials, certainly appears slightly thicker. (See Salm-Dyck's second paragraph). Reference to the original description of G. schroederianum by Osten (1941) reveals the following statement:- "The spines which are usually seven in number are yellow when young, soon becoming grey, and having a reddish-purple base. They are appressed, and together take on the appearance of a dragon-fly at rest; the two upper spines are the shortest, being directed obliquely upwards. The next two on each side are larger and spread laterally (the wings) and the last being the largest, is directed vertically downwards (the abdomen of the dragon-fly)." This would appear to be a very close approximation to the old descriptions in terms of spine number and arrangement.

One is left with the problem of the purplish brown tips mentioned in the spine descriptions of the older authors. To the naked eye, the brownish bases of the spines of G. schroederianum are very obvious, but the remainder of the spine appears to be very pale yellow. However, on examining more closely the specimens in the reference collection with a X10 hand lens, it was immediately seen that one at least had minute brown tips, not more than 1 mm long, on all the spines. In the second, this was not true of all spines, but smaller brown tips were certainly visible on some, particularly the younger ones. It

would seem therefore reasonable to suggest the possibility that G. hyptiacanthum and G. schroederianum are one and the same plant.

G. schroederianum was collected by Dr. Schroeder in 1922 but was described for the first time by Osten in 1941, and few if any plants came into cultivation in Europe. Only in 1967 was it re-collected in habitat and became available to collectors and growers in Europe, in some quantity and possibly for the first time. This would explain the confusion over G. hyptiacanthum and the doubts as to its very existence, for until the last few years, modern workers had nothing in their collections which fitted the old original description of Lemaire. For the purpose of the present work, however, it will be assumed that the two species are in fact different and will thus be dealt with under their respective headings. The topic will be returned to later.

Description:

The original description of Lemaire (1839) reads as follows:

Plant body flattened hemispherical, strongly depressed at the centre, deep green in colour. The specimen that Lemaire described measured 6.5 cm in height and 5.1 cm in diameter and appeared to be adult, though we are not told on what grounds he assumed this. The tubercles were arranged in eleven vertical rows, forming ribs, while the spaces between the ribs had sinuous margins and a greener line running down them. The tubercles were somewhat hexagonal at their bases and separated one from another by fairly short but deep transverse grooves. Tubercles measured from 9.2 - 11.5 mm in width at the base. The areoles were oval, furnished with rather fluffy wool, whitish in colour persisting for a long time and soon becoming greyish. There were six or seven spines of different lengths, one or two erect at the top of the cluster, almost bristle-like,

2.3 - 4.6 mm long; four arranged in two rows directed laterally, of which the two lower were somewhat stronger, 6.9 - 9.2 mm long. The last one, the hind-most, 9.2 - 11.5 mm long. All of the spines were very slender though moderately rigid, incurved towards the plant body, golden yellow in colour, with dark purplish-brown at the base and tip.

Salm-Dyck (1850) after repeating exactly the diagnosis of Lemaire, adds some further information. His particular plant was 3.8 cm in diameter, depressed above, with small closely packed tubercles. The three lowest spines were a little stronger than the rest, the lowest of all, the median spine, measuring 9.2 mm and described as "thick, recurving, appressed, and reaching to the next lower pulvinus". As before, the spines were all golden yellow with purplish base and tip. His plant had not flowered and the country of origin was still unknown.

Labouret's account (1858) adds the information that the flowering season in Europe is June, July and August, and although the ^s statement is made that the flowers have not been described, their white colour is mentioned, as is also the scaly tube "like that of E. monvilli". Three varieties of E. hyptiacanthus are listed and briefly described as follows:-

E. hyptiacanthus eleutheracanthus Monville. A variety which has spines less appressed against the plant, at it were open, as opposed to the arrangement that they have in the type.

E. hyptiacanthus nitidus Monville. A variety in which the body is a more bright shining green, the spines are also more coloured.

E. hyptiacanthus megalothelus Monville. It only differs in that the tubercles are larger, seven spines and one upper, very small.

All three of these seem to be rather trivial variations of the type species and indeed, later authors have either ignored them or reduced them to synonymy with the type.

For the reasons given above, no account of more recent authors has been taken in compiling the description of this species.

Habitat:

The older writers would appear to have had no information as to the origin of their plants. Because of the assumed synonymy between this plant and E. leeanus, Schumann (1898) gives the country of origin as Uruguay. Britton & Rose (1922) also give Uruguay but as they preferred to exclude E. leeanus from their concept of the species, their justification for assuming this is uncertain. However, if G. schroederianum proves to be G. hyptiacanthum under a new name, then the origin of G. hyptiacanthum is, indeed, Uruguay. If this identity is not accepted, then the origin of Lemaire's plant remains a mystery. (See sketch-map under "G. schroederianum"). Seed of this plant was offered not long ago by Uhlig in Germany under the collector's numbers U 15 and U 51 possibly collected by Lembke during the 1961-62 season, but no habitat information is to hand. However, owing to the general confusion surrounding the plant, it is highly likely that the seed referred to is from plants of G. leeanum or closely related numbers of that form-group and not the genuine species re-discovered by Buining as G. schroederianum several years later.

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GYMNOCALYCIUM SCHROEDERIANUM Osten

C. Osten, Notas sobre Cactáceas. In Anales del Museo de Historia Natural de Montevideo, Vol.2, part 5, p.60. 1941.

Synonymy:

There are no synonyms of this species unless it be confirmed that G. hyptiacanthum is indeed the same plant, in which case the far older name of Lemaire has priority and G. schroederianum will then disappear.

Diagnosis:

Gymnocalycium grege E. monvillei Lem. Cormus haemisphaericus, 7 cms. altus, 1⁴ cms. diametens, cinereo-viridis opacus, vertice profunde umbilicatus, tuberculatus inermis. Costis 2⁴ in tubercula tetragona usque hexagona disjunctis. Areolis juventute valde lamatis magnis oblongis, 2 cms. inter sese distantibus. Aculeis radialibus cormo adpressis, 7, juventute flavis, squamatis, base purpureis, mox cinerascentibus, aculeus centralis typice haud exstat sed hinc inde accedit. Fasciculus aculeorum libellulae formam simulat. Floribus viridescenti - albis, ovaris glabro-cylindrico.

Bacca clavata, apice truncata cinereo - viridi. Differt a E. monvillei (e descriptione) colore cinerascente, haud flavescenti viridi, aculeis brevioribus; a E. uruguayensis Arech. cormi florumque colore et bacca clavata; a E. melanocarpus Arech. bacca clavata cinereo-viridi. (Surely a printing error for "cinereo-viridi").

Habitat in civitate Rio Negro reipublicae Uruguay, in limo pampeano ad ripam fluminis Uruguay prope Nueva Mehlem. (Osten 1941).

This species appears to have been first collected by a Dr. J. Schroeder on the banks of the Rio Uruguay near Nueva Mehlem, Uruguay, in April 1922 (1941). The plant is described as having flowered abundantly in cultivation from November of that year until February 1923 but only one mature fruit resulted and this ripened half-way through March. Two photographs illustrate the plant, one taken soon after collection, it would seem, and the other when the plant flowered. The plant was then apparently dried and put into Osten's herbarium collection under the number 16.873 and remained there undescribed until Osten's publication in 1941. No further specimens were available to him at the time of writing as he records that certain aspects of the flower were unknown to him, a matter which he would have presumably remedied had live material been to hand.

In the same account, Osten describes how the original plant came, not as might have been expected, from the dry stony soils of the hilly areas, but from "Pampas mud, that was in many places slightly salty and that did not support a continuous ground cover of pasture but groups of low-growing shrubs and small trees". He also lists the associated plants of the area and it is of interest to note that four of the plants recorded were also Cacti, so that one must be very careful not to assume that a particular habitat is unsuitable for the growth of such plants merely because of its moist nature for at least some period during the year - in this instance during the summer when rains much farther north swell this river and cause flooding as the water drains away southwards, supplemented by local heavy showers.

For a number of years after 1941, no more was heard of this plant and its very existence was doubted by many authorities. However, in the latter part of 1968 Buining (1968c) visited the area and searched for the plant. In his account he describes his difficulty in finding Nueva Mehlem, the place not being marked on any of his maps. The present author too, has failed to find it on those at his disposal. (Incidentally,

in the course of the article, Buining erroneously attributes the collection of the plant to Osten instead of Schroeder). However, after enquiry amongst the local inhabitants, the place was located in the area between Paysandu and Mercedes, but he was unable to find any specimens in the vicinity. He does not make it clear where he eventually found the plant, though by implication it was not far off, on the banks of the Rio Uruguay in "wet muddy clay". According to another account by Donald (1970) of the same collecting trip, Buining discovered it on the banks of the Uruguay river, just north of Nuevo Berlin, on mud flats. Other than these two localities (possibly one, if this is a matter of confused names, and this seems likely as Osten was probably working from field notes written by someone else (Dr. Schroeder) and after a lapse of nineteen years) no details of distribution seem to be available, Backeberg (1959) and (1965) merely stating "Uruguay". The collector's number HU 289 (1965/1968) was given to the Buining material.

Osten himself, (1941) states that his plant "certainly belongs to the same group of related species as Echinocactus monvillei, (this is very much open to question but will not be discussed further at this point) but is sufficiently different to be separable from it by the grey-green colour and by the smaller size of the tubercles and spines."

From Paysandu, a little to the north of Nuevo Berlin, Arechavaleta (1905) had described a species to which he gave the name Echinocactus melanacarpus which coincides with the plant under discussion in the form of the body and in the colour, but the ribs number only 15 and the spines 10 - 12. Arechavaleta said that he had not seen the flowers but that the berry differed completely and described it as exactly like his other species, Echinocactus uruguayensis, colour dark olive green and shaped like an egg, whilst the shape of the fruit of G. schroederianum is truncated club-shaped and is pale grey-green in colour. For this reason the two plants cannot be identified as the same species.

In the opinion of Donald (1970) who has an example of the recently collected material in his collection, it is quite separate from the yellow-flowered Uruguayan *Gymnocalycium*s. He describes the plant body as being larger than the average *G. uruguayense* (which is conspecific with it, according to him) and it forms offsets less readily. Spines are about five in number, quite short, white in colour, with characteristic red base. The flower tube is thinner and longer than in *G. uruguayense* and the whole perianth is virtually white. Stamens and stigma are quite normal with no evidence of unisexual flowers, a feature of a number of the Uruguayan *Gymnocalycium*s, and he expresses the opinion that the plant "should stand in its own right as a species of the Denudata group of the *Macrosemineae*".

This last statement is not, however, borne out by the facts. Donald's description of the imported plant and the present author's examination of the two seedling plants in the reference collection, together with Osten's original description and his photographs, lead one to the conclusion that those plants are outside the Denudata group as it is at present constituted. In body characteristics and seed type, the plant more closely resembles *G. leptanthum* and *G. platense*. Backeberg was obviously of the same opinion when he inserted this species immediately following the above-named plants in his account of the genus (1959). Schütz (1962) includes this species as an appendix to his first version of the classification of the group without allocating it a place. In his more recent version (1968) it has been placed (with a query) in the Denudata section of the *Macrosemineae*. The reason for this uncertainty is not known, but it could well be that no material for study was available to him at that time, and that he was merely following previous authors in this. Unfortunately Buxbaum (1968a) does not place *G. schroederianum* in his seed classification at all, listing only selected species as examples. Neither does it appear in a later summary (1971) where some other new

and the largest diameter in fully open flowers is about 5.5 cm. The ovary is about 20 mm long and 7 mm in diameter, cylindrical, a dark olive green colour on the outside, entirely glabrous, and provided with kidney-shaped scales (4 mm in breadth by 2.5 mm in height) with a whitish border and olive green centre. The corolla tube, narrow at the base, widens abruptly to form a funnel shape, being externally a little paler in colour than the ovary. The scales gradually lengthen and become transformed into the outer perianth segments. The colour of the scales is also pale olive green, the whitish margin becoming wider and wider, meeting at the top in a pale chestnut brown area. The scales of the tube measure 5 mm in length and 5 mm in breadth and the outer perianth segments, which are lanceolate and sharply pointed, measure 25 mm x 6 mm. Those that are towards the centre are uniformly greenish white in colour, the green exterior becoming transformed to a dorsal stripe which gradually disappears. The innermost perianth segments (petals), are somewhat smaller, lanceolate - spatulate, with toothed extremities and a long mucronate tip, and are pale greenish white, with a pale green base. The bottom of the flower on the inside is coloured a beautiful rose pink. The filaments of the stamens are inserted in a very disorderly manner; the upper ones in the corolla tube reaching to half the length of the external perianth segments, are pale greenish yellow with cream-coloured anthers. The style is greenish white, some 14 mm long in the male phase (with anthers already mature) with a stigma pale yellow in colour in the closed state. The style reaches to half the length of the largest stamens, but unfortunately it was not observed if it lengthened during the female phase.

Halfway through March 1923, after it had produced many flowers, a single ovary reached maturity. The fruit, as might be expected from the ovary having an elongated form, was elongated pear-shaped, truncated in its upper part. The length was about 25 mm, its greatest width in the upper third of its length was about 5 mm, having a pale grey-green colour,

and bearing scales with wide white borders (2 mm high and 4 mm wide) and with a white margin of 1 mm width. It was surmounted by the dried flower remains measuring about 25 mm in length. The fruit opened by a single median longitudinal split. The seeds were spherical, truncated at the base, approximately 1.2 mm in size.

The plant differs from E. monvillei (from its description) by its greyish colour, by no means yellowish-green as in this plant, and by its shorter spines; from E. uruguayensis by its flower and body colour and club-shaped fruit; from E. melanocarpus by the grey-green club-shaped fruit.

The brief descriptions of Backeberg (1959) and (1965) add nothing to, nor disagree with, any of the above statements.

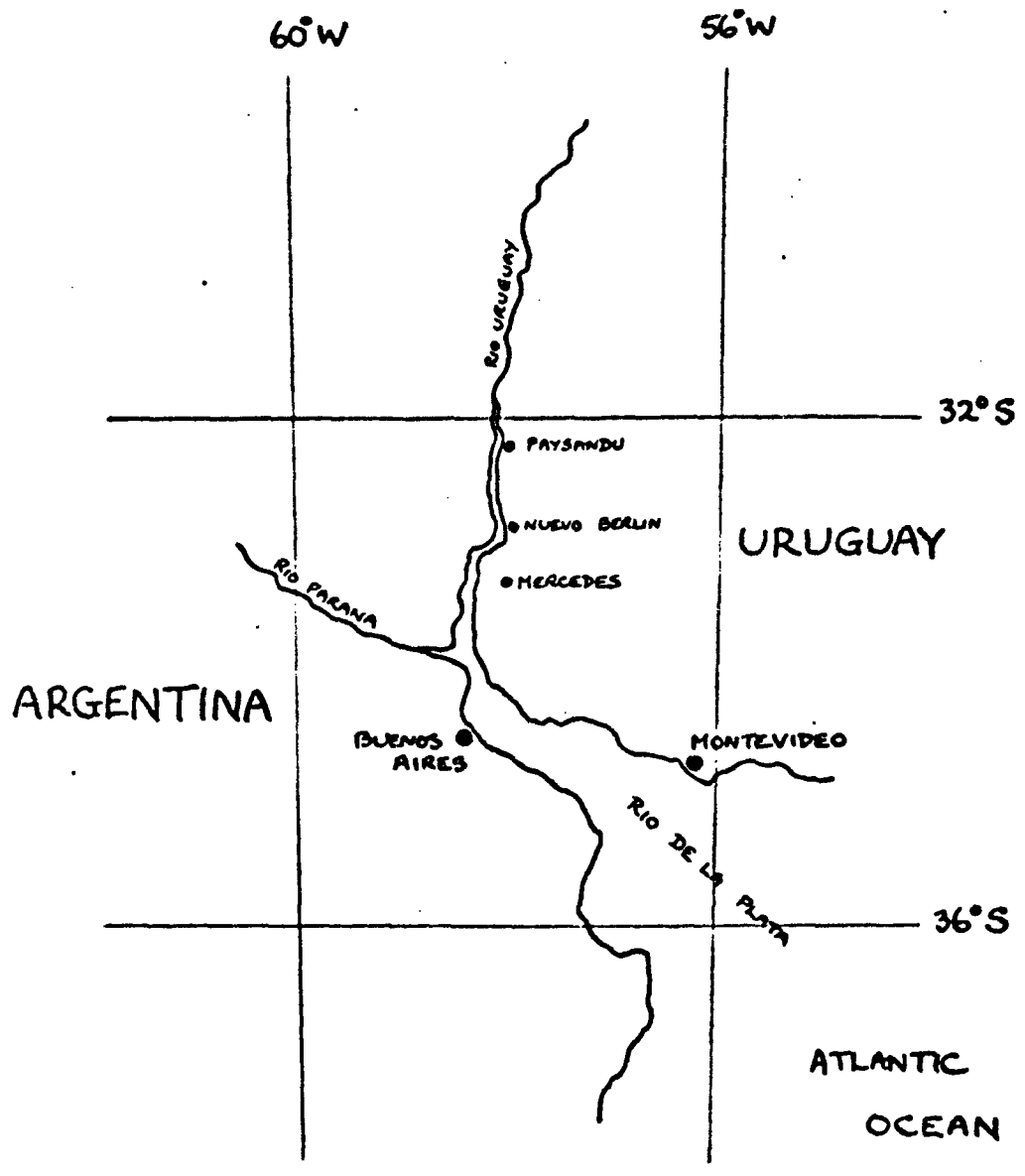
Habitat:

Osten states that the plant was found in the state of Rio Negro, Uruguay, in muddy grassland (Pampas), on the banks of the Uruguay river near Nueva Mehlem, in April 1922. Backeberg (1959) and (1965) gives only "Uruguay". Buining (1968) is reported to have found it in "wet muddy clay" on the banks of the Rio Uruguay, just north of Nuevo Berlin. It is assumed here that Osten's "Nueva Mehlem" is in fact the same as Buining's Nuevo Berlin, the latter appearing on maps but not the former.

Map References:

PAYSANDU	58° 06' W	32° 19' S
NUEVO BERLIN	58° 03' W	32° 58' S
MERCEDES	58° 04' W	33° 15' S

Sheet: I 21 - Buenos Aires - Montevideo



Parts of S.W. Uruguay & N.E. Argentina.

Distribution of G. SCHROEDERIANUM.

(Scale: 1° = 105 miles.)

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the petal shape now becomes " spatula-shaped, to some extent ending in a point" in contrast to Dölz who stated " ... more or less running out into a point, particularly the innermost ones which are much smaller than the others and in addition they are irregularly toothed." Toothed petals, in the present author's experience, are extremely rare within the genus Gymnocalycium and had Backeberg been familiar with plants corresponding to Dölz's description, it seems highly unlikely that he would have failed to comment on this feature. This unfamiliarity probably explains the most critical alteration to the original description and also his assumption that this plant belonged to the G. capillaense - sigelianum - sutterianum complex, something which is by no means proven when all the relevant facts are considered. In fairness however, it must be said that the photograph of a flowering specimen published by Dölz (1943) but taken by Andreae, does not appear to be of a typical plant, differing as it does to some extent from Dölz's own photograph in the same publication but unfortunately this latter plant does not bear a flower.

Description:

This is based only on the original Latin diagnosis and the more detailed description in German which followed it.

Body flattened spherical, 6.5 cm in diameter by 4.5 cm in height, dull dark green, the young growth shining olive green; the growing point lacks spines and bears a little wool between the young tubercles; ribs 7 - 8 in number broad and flattened towards the base; areoles oval, about 1.5 cm apart, bearing dirty white wool felt, at first more voluminous, later almost negligible; spines usually seven, all radials, one in the mid-line pointing downwards, always two pair slanting downwards, and a further pair slanting upwards, all but the much shorter upper pair, up to about 2.5 cm long, dirty pale yellow to whitish, more or less brownish at the base, occasionally with a darkish tip, rough, moderately rigid (at the base up to $\frac{2}{3}$ mm in diameter), but also somewhat flexible, sharp and piercing, more or less repeatedly bent and twisted, irregularly

arranged, in old age more or less appressed, but earlier more outstanding, spines of neighbouring areoles interwoven to some extent. Occasionally one or both spines of the upper pair are missing; occasionally an eighth or ninth shorter, more delicate spine develops at the upper end of the older areoles. Here and there, according to Andreae, a central spine also occurs, of similar strength and size to the radials.

Flowers arise from the areoles near the growing point, about 4.0 - 5.0 cm long and the same in diameter; ovary in the region of 6.0 - 7.0 mm long and broad, almost square; scales semi-circular, whitish, yellowish to brownish at the centre; outer perianth segments white, pale pink at the base on the outside, with a greyish-brown central zone, while inside there is a quite pale lilac-pink central line; inner perianth segments white (creamy-white), pale pink at the base, more or less running out into a point, particularly the innermost ones which are much smaller than the remainder and in addition they are irregularly toothed; flower tube pink inside, pale brownish-red on the outside; pistil moderately strong, white, 1.8 cm long (including the stigma); stigma lobes 8 in number, yellowish white, reaching the uppermost of the loosely arranged anthers; filaments white, anthers yellow.

Seed longish, cap-shaped, about 1.2 mm long by 0.8 mm in diameter, matt black with sunken hilum.

Dölz concludes his description with the following note:-

The species is characterised by its moderately long and twisted spines and the shortness of the ovary. The colour of the inside of the flower tube is not, as often occurs (in other plants G.J.S.), lilac to wine-red, but pink. Unless the flower is dissected, this is not immediately obvious. The arrangement of the perianth segments in several rows gives the appearance of a semi-double flower.

Habitat:

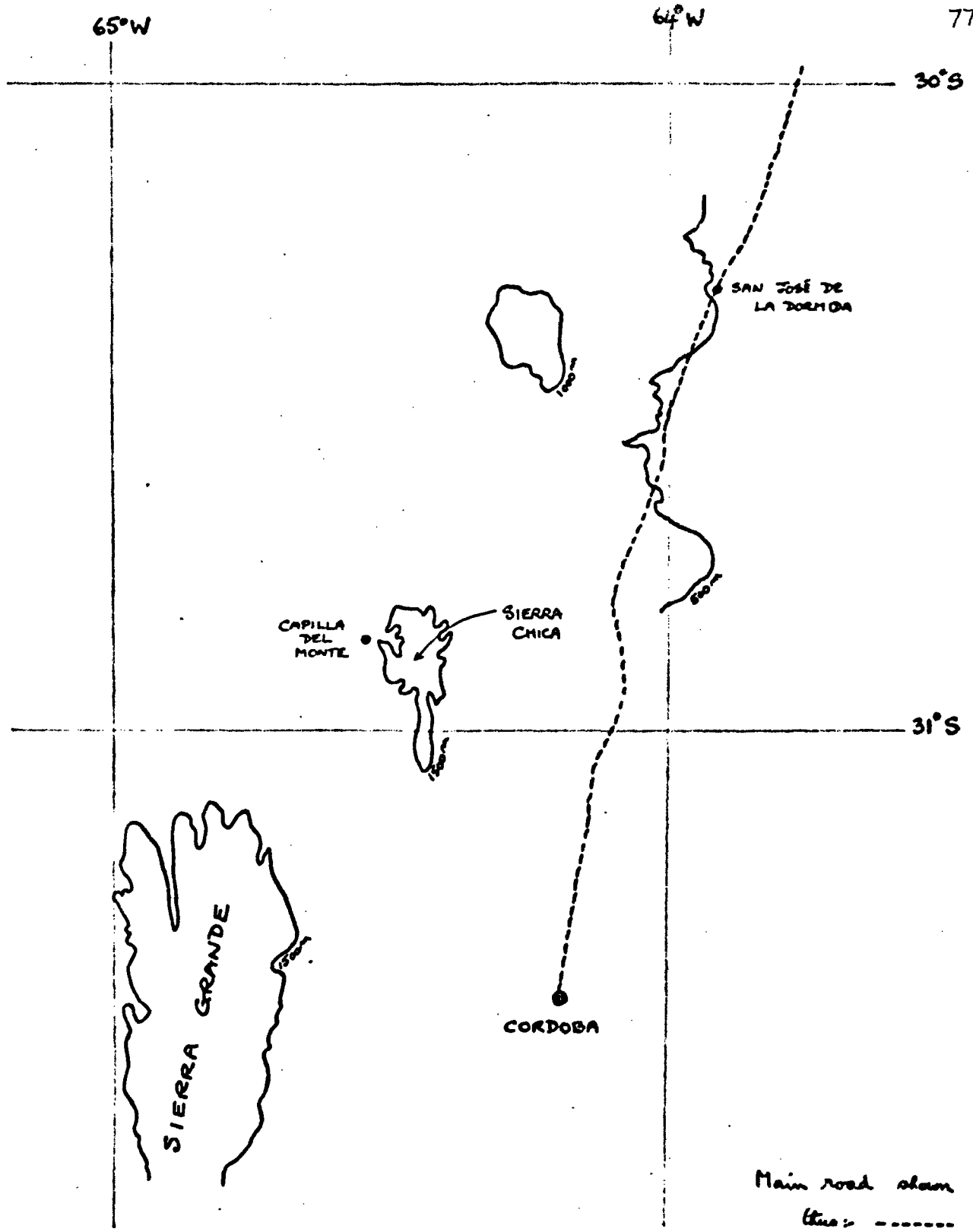
The original description gave no habitat details but subsequent

authors such as Backeberg (1959) have assumed the place of origin to be the same as that for G. sigelianum with which the new species was found associated (in De Laet's greenhouse) namely the northern end of the Sierra de Cordoba, Argentina. Dölz is reported by Donald (1971) to have specified the Sierra Chica (presumably in a later publication) and Frank (1970) is alleged to have done likewise, though the translation of this latter article to hand (1971) does not bear this out. In fact, the only evidence available to the present author indicates that the habitat may well be further north. Seed offered in Europe by the African Succulent Plant Society in 1971 was described as collected in habitat 110 Km north of Cordoba. This would place it about 70 Km further north-east from Capilla del Monte and the Sierra Chica. Rawe (1974) records finding the plant 115 Km north of Cordoba, growing on the top of fairly low granite hills. He describes how the hills increased in height somewhat as he reached the 115 Km mark, and indeed, on the large scale map, the 500 m contour is crossed by the main road at about this point, dropping down again below this level at San José de la Dormida about 8 Km further on. No other habitat information is available at present.

Map references:

Rawe habitat locality	63° 57' W	30° 25' S
SIERRA CHICA	64° 27' W	30° 53' S
CAPILLA DEL MONTE	64° 32' W	30° 52' S

Sheet: H 20 - Cordoba - Santa Fe



Northern part of the Sierra de Cordoba, N. Argentina.

Possible habitat of G. DEESLIANUM.

(Scale: 1" = 16 miles)

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Group D

1. G. platense
2. G. gibbosum
3. G. brachypetalum
4. G. chubutense
5. G. striglianum

This group is a fairly well defined one, comprised of a rather isolated species in Mendoza to the west, together with the four most southerly occurring species of the genus. G. platense is still rather a problem plant, but if it does exist in the form and place envisaged here, it provides a convenient link between the rest of this group and the more primitive representatives of the genus found in Uruguay to the north.

The distinct impression gained from the survey of the varieties of G. gibbosum here listed seems to be that there may be some justification for combining together all those plants with spines of a pale colour with darker bases into a separate group (species ?) and leaving G. gibbosum as a species with dark brown to black spines. However, collectors seem to visit the habitat of these plants but rarely and the European investigator has very little reliable material to work on. It could well be that when live material eventually does become available, this idea will prove to be untenable and a fresh approach will have to be made to the whole problem.

GYMNOCALYCIUM PLATENSE (Britton & Rose) ex Spegazzini

Spegazzini; Nuevas notas Cactológicas, In Anales de la Sociedad Científica Argentina, Volume 99, p.142. 1925.

Synonymy:

- ECHINOCACTUS PLATENSIS Spegazzini, Contribucion al estudio de la Flora de la Sierra Ventana, La Plata, p.28. 1896.
- ECHINOCACTUS STENOCARPUS Schumann, Monatschrift für Kakteenkunde, Volume 10, p.181. 1900.
- ECHINOCACTUS GIBBOSUS var. PLATENSIS Spegazzini, Notes Synonymiques, In Anales del Museo Nacional de Buenos Aires, Series 3, Volume 2, p.7. 1903.
- ECHINOCACTUS PLATENSIS var. TYPICA Spegazzini, Cactacearum Platensium Tentamen, In Anales del Museo Nacional de Buenos Aires, Series 3, Volume 11, part 14, p. 504. 1905.

Diagnosis:

Eu-echinocactus, asynechogonus, glaber, glaucescens, heptacanthus; globoso-obconicus, centro applanto-umbilicatus; costae v. melius tuberculorum series, 14 rectae v. vix subspirales crassae obtusae, sinibus obtusissimis latis separatae, tuberculis superis bene evolutis, inferis fere evanidis, vallibus rugiformibus acutis separatis, ex hemisphaerico obscure pentagonis, antice late obtusatis, postice subangulatis atque gibbula acutiuscula dentiformi brevi donatis, apice late rotundatis atque umbilicato - areoliferis; areolae longitudinaliter ellipticae, vix cinereo-velutinae, tipice 7 (sed saepe 5 tantum) spinosae: spinae omnes radiantes, divaricato - adpressae, supremae breviores, infima impar maxima, albae, non v. vix pulverulentae, basi non bulbosae atque breviter purpurascens, teretes acutae: flores tubuloso - campanulati, mediocres, extus bracteosi laevissimi, obscure glauco-virescentes, petalis albidis. (Spegazzini 1896).

Varieties:

var. <u>LONGISPINUM</u>	nomen nudum)	
var. <u>SCHMOLLII</u>	nomen nudum	)	All of very doubtful validity.
var. <u>WEEMIANUM</u>	nomen nudum)	

Cultivar:

cv. HENISSII (various alternative spellings)

Reputedly a hybrid, G. quehlianum x G. platense, of
commercial origin.

Spegazzini (1896) first described this plant as Echinocactus platensis, a plant found in the Sierra Ventana and other mountainous areas of the pampas, in the province of Buenos Aires, Argentina. He pointed out at the time that it appeared very similar to another that grew in the Sierra de Cordoba, but that the latter plant had fewer and much shorter spines. Seven years later however, possibly in deference to the opinions of European experts such as Schumann, he published a new combination (1903) (Britton & Rose (1922) give "1902" but this must surely be an error.) making the plant a variety of E. gibbosus. Later still (1905) he reversed his decision and he re-published E. platensis with full specific rank and added three varieties to it. Britton and Rose (1922) not content with reducing all three of Spegazzini's varieties to synonymy with the species, added as another synonym, Spegazzini's E. baldianus. Spegazzini (1925), admitting that his original description of the floral characteristics of E. platensis ^{was} ~~were~~ vague and superficial, remedied this defect and not only refused to abandon his varieties but in fact published two of them as full species. (G. leptanthum and G. parvulum). The third had already been published as a full species by Haage (1899). Spegazzini states quite clearly and categorically that "I propose that the name of G. platense Speg. be reserved for the old variety typica represented by fig. 177 on page 164 of Volume 3, The Cactaceae, Britton & Rose." In addition he also rejected the synonymy of E. baldianus with E. platensis.

Backeberg (1959) who had obviously studied the earlier literature, ignored the massive synonymy of Britton & Rose and omitted mention of G. baldianum, G. leptanthum, G. quehlianum and G. parvulum from it as Spegazzini had indicated. In his description, however, he does not seem to follow that of Spegazzini and suggests (albeit with a query) that the seed group is Type 5, when it should be Type 2. The reason for this is that in fig. 1639, p.1712 is shown, over the name G. platense, what

could well be a member of the Trichomosemineae (Seed Type 5) and it does not resemble what the present author understands to be G. platense at all. In his Lexikon (1965) however, Backeberg gives the correct seed group (Type 2), and the brief description more closely approaches in some details at least, that of Spegazzini, so that in the interval between publications his opinions regarding the nature of the plant had been somewhat modified.

It is generally accepted that the correct name of this plant is G. platense (Speg.) Britton & Rose 1922. However, in view of Spegazzini's clear indication (1925) of the much narrower view that he took of the species, the correct name should surely be G. platense (Br. & R.) ex Spegazzini 1925. In the light of his own interpretation of the species on similar lines to that of Spegazzini, this modification should have been noted by Backeberg (1959) but this he failed to do.

Description:

The following description is based entirely on descriptions by Spegazzini (1896, 1905 & 1925).

The plant body is globose - obconical, tending to become cylindrical. The crown is somewhat flattened and the growing point umbilicate. There is no wool in the region of new growth. The size ranges from 6 - 10 cm in diameter and from 8 - 10 cm in height. The body colour is described as ashy dark green, somewhat glaucescent. The ribs, probably better described as series of tubercles, usually number 14, and are straight or slightly spiralled. They are thick, blunt and separated by wide and very obtuse sinuses. The tubercles, well developed in the upper parts of the plant, almost disappear towards the base. They are separated one from another by sharp wrinkle-like furrows. In shape they are hemispherical to somewhat indistinctly five-sided, wide and blunt adaxially, angular on the abaxial side, having a sharp tooth-like chin. Apex broadly rounded and bearing the areole. Fairly large in size, about 15 mm in diameter and 5 - 7 mm high. The areoles are longitudinally

elliptical, somewhat depressed and very sparsely furnished with ashy-grey felt. Spines from 5 - 7 in number, centrals often completely absent. They are white in colour, purplish for a short distance at their bases. They are widely spreading and appressed, slightly if at all puberulent, base not swollen, sharp, slender, somewhat curved and circular in cross-section. The uppermost pair are the shortest (5 mm) while the four laterals measure 10 mm. The lowest downwardly directed spine is the longest, measuring 15 mm. The flowers appear in the region of the "shoulder" of the plant, erect, tubular to bell-shaped. The ovary is almost cylindrical, measuring 12 mm in length and 6 mm in diameter. The flower tube, barely equalling the petals, is 15 mm long. Both tube and ovary are glaucous green in colour and bear very smooth scales which shade from violet to colourless. Internally the flower tube is violet coloured. The petals are white, and larger towards the centre but always fairly narrow, 30 - 35 mm long by 5 - 6 mm in width, lanceolate, acute, and with entire or denticulate margins. The stamens are arranged in one continuous series over the whole of the flower tube and the anthers are yellow. The style is white, cylindrical, and bears at the top 5 - 7 white stigma lobes reaching to the level of the anthers of the uppermost stamens but not exceeding them.

There would appear to be no validly described varieties of G. platense in the literature other than those transferred to the genus Gymnocalycium by Y. Ito (1957) from Spegazzini (1905) as G. platense var. leptanthum, var. parvulum and var. quehlianum, all three of which are considered to be of species rank by most authorities, and of which the last two are outside the scope of the present treatment, being members of the Trichomosemineae. Further consideration is given to G. leptanthum under the species heading.

Several other varieties appear in the literature from time to time but due to the extreme confusion amongst growers and collectors at the

present time as to what really constitutes G. platense and also to the fact that no descriptions appear to have been published, they have little value and are mentioned here only for the sake of completeness.

In Kaktus ABC (1935) Backeberg & Knuth mention G. platense var. hyptiacanthum but in Die Cactaceae (1959) Backeberg admits that this was an invalid combination and that he now regards G. hyptiacanthum as of species status.

G. platense var. weemeanum was listed merely as a name of unknown origin by Backeberg (1959) and recorded as a nomen nudum by Putnam (1969). Search of the literature has produced no further information regarding a variety but in the journal Cactus (1931) a picture appeared of Echinocactus terweemeanus which by the unusualness of the specific name, could well refer to the same plant. Unfortunately the text has not yet come to hand, only the picture, and it is extremely difficult to decide from this alone, to what group the plant belongs. It could equally well be Ovatisemineae or Trichomosemineae, but certainly comes well within the compass of the G. platense controversy. Further investigation is required here.

Putnam (1969) lists G. platense var. longispinum as an obscure name of unknown origin. He also records G. platense var. schmollii, De Laet, as a nomen nudum but later describes it (1970) as having a long and very slender flower tube, a dark green body and rounded ribs.

More recently, Zecher & Rausch (1973) have mentioned the discovery of a yellow flowering form of G. platense in the Sierra Ventana, but no further details were given.

Finally one must mention here a plant which is often distributed commercially in the guise of a true species, "G. henissii". The spelling varies from author to author! According to Putnam (1969), this is really a cultivar name for a hybrid between G. quehlianum and G. platense and is probably of Belgian commercial origin.

Habitat:

Spegazzini (1896) described the plant as being common in rock crevices on the hillsides of the Sierra Ventana and fairly frequent also at Curá-malal and in other mountains of the pampas. Later (1905) he adds Olavarría to the list and later still (1925) Tandil.

Map References:

SIERRA VENTANA	61° 58' W	38° 08' S
SIERRA DE CURÁ-MALAL	62° 16' W	37° 48' S
OLAVARRÍA (Town)	60° 19' W	36° 54' S
SIERRA DEL TANDIL	59° 05' W	37° 30' S

Sheets: J20 - BAHIA BLANCA
 J21 - MAR DEL PLATA

(FOR SKETCH MAP SEE UNDER G. GIBBOSUM.)

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GYMNOCALYCIUM STRIGLIANUM Jeggle

W. Jeggle, Kakteen und andere Sukkulente,
Vol.24, No.12, p.267. 1973.

Diagnosis:

Simplex, breviter, 30 - 50 mm altum, 40 - 80 mm crassum. Epidermis glaucus. Radix brevis. Costae 8 - 12 undulatus. Areolae ovaes, 2 - 3 mm crassum, 5 mm long, 10 - 15 mm inter se remotus. Spina 3 - 5, 15 mm long, fuscus.

Flores 40 mm diam. et 50 mm long, albidus. Pericarpell longus, deto Receptaculum. Stylos, stigmatibus 10 pallidus flaveus.

Fructus griseus - viridis, longus. Semina diam. 1 mm, 1.5 mm long. Testa nigra. Hilum ovoideum. (Jeggle 1973).

This plant was named after Herr Franz Strigl, an Austrian cactus enthusiast, by Herr Walter Jeggle (1973). The material was collected by Herr Walter Rausch during his fifth South American collecting expedition and reached Europe in February 1973. There were about 30 specimens all told, ten being kept by the author, the remainder being placed in the care of Herr Strigl. After studying the flowers and fruits produced in Europe during the summer of 1973, it was decided that the plants represented a new species.

From the four photographs published, the plant body and spination seem to be quite variable. It is said that the nature of the seed (which regrettably is not illustrated) places the new species in the Ovatisemineae group of the genus according to the classification of Schutz and Type 2A in the classification according to Buxbaum. The Rausch collection numbers under which the plants were placed are unfortunately not recorded.

Description:

The following description is derived from the original Latin diagnosis and the German text associated with it.

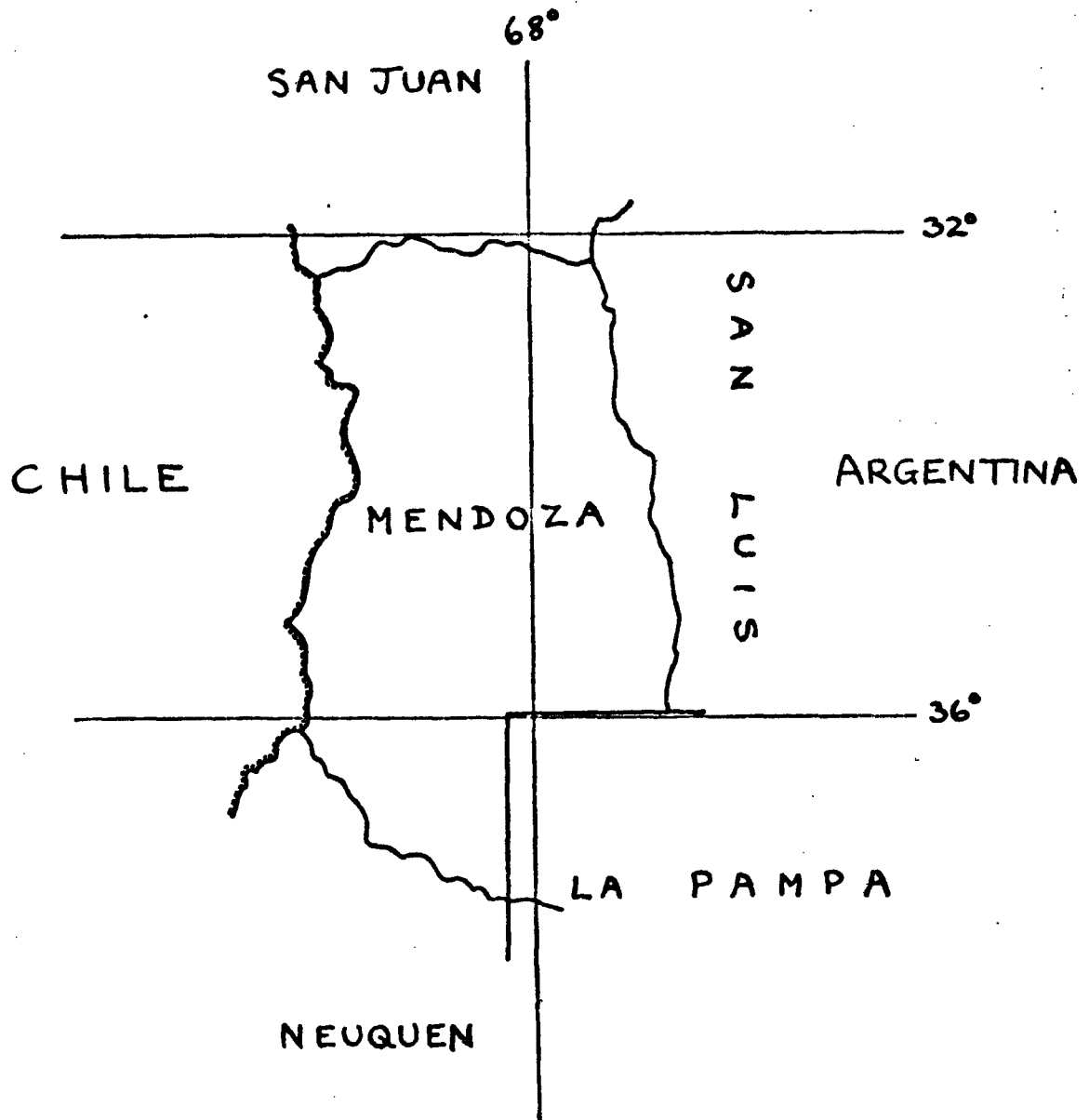
Plant body single, short, 30 - 50 mm high, by 40 - 80 mm broad. Epidermis blue-grey to brown in colour, glaucous. Root short. Ribs 8 - 12 separated by somewhat wavy furrows. Areoles 10 - 15 mm apart, moderately elongated, 2 - 3 mm wide and 5 mm long, bearing greyish brown wool. Spines 3 - 5, up to 15 mm long, dark blackish brown, not going grey with age. Flowers 40 mm diameter and 50 mm long, creamy white with pinkish tinge. Pericarpel and flower tube longish, together bearing some rounded, white-bordered scales. Style with 10 pale yellowish stigma lobes, not attaining the height of the numerous stamens. Fruit grey-green, elongated, opening longitudinally. Seeds 1 mm in diameter, 1.5 mm long, testa black and rough. Hilum region ovate, flat, with thinner (lighter ?) border.

Habitat:

Habitat details are sparse, the Department of Mendoza, central western Argentina, alone being given. It is interesting to note that as far as the present author's records go, this is the first time that a representative of this seed group has been found in this area, the only other two Gymnocalycium species recorded being members of the Microsemineae.

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No.12, p.267.



Province of Mendoza, Western Argentina.

Habitat area of *G. STRIGIANUM*.

(Scale: 1" = 105 miles.)

GYMNOCALYCIUM GIBBOSUM (Haw.) Pfeiffer

L. Pfeiffer: Catalogue of Cacti belonging to Mr. Schelhase, 1843 & 1844. Repeated in Abbildung and Beschreibung Blühender Cacteen, Volume 2, under plate 1, 1845.

Synonymy:

<u>CACTUS GIBBOSUS</u>	Haworth, Synopsis Plantarum Succulentarum p.173. 1812.
<u>ECHINOCACTUS GIBBOSUS</u>	De Candolle, Prodrumus Volume 3, p.461. 1828.
<u>CEREUS GIBBOSUS</u>	L. Pfeiffer, Enumeratio diagnostica Cactearum hucusque cognitarum, p.74. 1837.
<u>ECHINOPSIS GIBBOSA</u>	L. Pfeiffer, (Recorded by Förster 1846) 1837 (?).

Diagnosis:

Cactus ? (Gibbous) subrotundus, profunde sub-sexdecim angularis; apice depresso, inermi; angulis gibbero notabili sub singulo fasciculo spinarum; spinis nigris. (Haworth 1812).

Varieties:

Because of the large numbers involved and the general uncertainty as to their validity, they are discussed at length following the description of the species.

NOTE: The compilation of a synonymy for Gymnocalycium gibbosum (Haw.)

Pfeiffer is not at all easy, as, over the years, opinion as to what should or should not be included has varied a great deal.

In the present treatment, all the varieties which have been found in the literature, have initially been listed as varieties, however flimsy their justification, thus eliminating temporarily a number of past authors' synonyms for the species.

Gymnocalycium gibbosum was first recorded (as Cactus gibbosus) by Haworth (1812) but the description is so brief as to be virtually useless. It would appear to be based on a single plant from the collection of a Mr. Vere. This gentleman, who had gathered together a collection of Cacti at Kensington Gore, London, from before 1808, grew Cactus gibbosus

from seed which had been obtained from Messrs. Lee & Kennedy of the Hammersmith Nursery. Unfortunately, no illustration is provided. Labouret (1858) very briefly describes certain features of his own three plants of this species but then goes on to quote Lemaire at some length. It is not clear to what extent this is an accurate rendering but a considerable amount of information is offered. In his final paragraph, Labouret describes the formation of offsets on his own plants in a way which leads one to suspect that perhaps they were not of this species at all! Although Labouret gives the countries of origin on p.254 as Jamaica and Mexico, in the Corrigenda on the last page of the book he records that Cels had just received "some excellent examples from the island of Lions (Isla des Leones) in latitude 45° S and from the shores of Patagonia."

Förster (1846) gives quite a detailed description of the plant which was only slightly modified and added to in the second edition of the book produced by Rümpler (1885). Schumann (1898) also describes the species, as he understood it, in a fair amount of detail, and gives the correct country of origin, namely Argentina. Previous authors had usually quoted Mexico, Guatemala and Jamaica as the source of the plant. Britton & Rose (1922), Berger (1929) and Backeberg (1936) produced only rather sketchy descriptions but in his *Die Cactaceae* (1959), Backeberg utilises Schumann's description with only a few modifications. Cabrera and Fabris (1965) give little detailed information and a rather poor illustration which helps very little.

It is very obvious from the numerous "varieties" described in the literature that this is a very variable species and one which has a very wide distribution. Consequently an adequate description is very difficult to draw up. The one which follows has been compiled by the present author very largely from the accounts of Lemaire (Labouret 1858), Förster (1846), Rümpler (1885) and Schumann (1898) and consequently is only a compromise solution. Many accurate field observations need to be

made and correlated before it can be safely assumed that it adequately covers the range of variation within the species. Collected material under the number FR 12, 1954/62, has reached Europe but no further information about it is to hand, and no other imports seem to have been documented.

Description:

Young plants simple, almost spherical, slightly flattened at the top. With increasing age, they tend to become club-shaped, and eventually cylindrical. They rarely form off-sets in cultivation. The plants appear to grow fairly slowly, so that columnar plants are rare. For habitat plants a height of 60 cm is quoted with a diameter of 10 - 15 cm (including spines). Cultivated plants would rarely appear to exceed a height of 20 cm and a diameter, once again, of 10 - 15 cm. The apex of the plant is somewhat depressed and lacks spines although tubercles are present. More mature plants are reported to have traces of short grey wool in and around the growing point. The colour of the plant body in the early stages is usually described as a slightly greyish glaucous green, becoming brownish green with age. The ribs number between 12 and 20, only one author (Labouret) mentioning an upper limit of 26, and as already noted, his plants would seem to be suspect. Well defined and sharply angled furrows separate the almost vertical ribs which are broad, blunt, about 1.5 cm in height and are broken up into tubercles by well defined cross-furrows. The tubercles themselves bear very well developed "chins" beneath the areoles, so that the areoles appear to be between the tubercles rather than on them. The size and shape of the areoles appear to vary a great deal but most authors agree that the sparse brownish white wool becomes grey with age and ultimately disappears. There are 7 - 10 (- 14) radial spines, although earlier authors give a smaller total, while centrals number 1 - 2 or may be lacking altogether, mainly in younger specimens. Spine colour varies widely, partly depending on the age of any one particular areole, but also depending on the variety of G. gibbosum

in question. The basic colour however seems to be brown, becoming grey with age. The spines are straight or slightly curved, rigid, sharply pointed and of varying lengths, the uppermost radials being the shortest, the lowest radial being slightly shorter than the laterals which measure 2.5 - 3.0 (- 3.5) cm. All radials stand out obliquely from the plant body. When both centrals are present, one tends to be directed outwards from the centre of the areole, the second situated above the first and directed somewhat upwards. Usually of slightly differing length, they measure approximately 3 cm.

The flowers which are produced abundantly from the top of the plant are usually said to be scentless but one author records them as "slightly scented". They are 3 - 5 cm in diameter and 6 - 6.5 cm in length (some authors 7 - 8 cm). The ovary (pericarpellary region) is top shaped, often somewhat curved, dark grey in colour, and bears semi-circular to triangular scales, which are brownish green with white borders. The flower tube is somewhat elongated, measuring 1.5 cm in length and approximately 1.2 cm in diameter and is generally dark green in colour. It bears rather sparse, moderately large, spatulate scales of a paler green, whitish at the edges, almost membranaceous and passing into perianth segments above. Sepals in two series of unequal length, the lower ones tinged reddish or brownish with a white border, the upper ones white, reddish at the tip on the outer surface. Petals in three series, the inner ones the longest, lanceolate, mucronate, obtuse, slightly longer than the sepals, somewhat reflexed at the tips. Often their colour is recorded as snow white with a pinkish stripe on the back, but some authors give pure greenish white or even creamy white. The filaments of the stamens are white, the anthers yellow. The stamens are numerous, inserted in tiers, the outermost equal in height to the rim of the flower tube, the inner one shorter; none of them reach the mid-point of the perianth segments. The style, which is robust, reaches or extends beyond the stamens and bears 10 - 15 radiating, sulphur yellow stigma lobes. The fruit is

about 3 cm in height, swollen oblong, bearing the shrivelled remains of the flower on top and scattered with large rounded scales. It is lead grey in colour, pruinose, and ripens after some 3 months, splitting down the side, exposing a large number of blackish seeds embedded in, and attached to, a mass of fleshy funicles.

Description of Varieties:

A large number of varieties of G. gibbosum have been named and, to some extent, described but the majority are of very doubtful value. However, for the sake of completeness, as many as have been encountered in the literature have been listed here in alphabetical order.

1. GYMNOCALYCIUM GIBBOSUM var. ALBISPINUM

This name has been seen in seed lists, but is probably a nomen nudum.

2. GYMNOCALYCIUM GIBBOSUM var. ALTHEAE Frič, nomen nudum.

The present author has a small seedling in his reference collection under this name but it is as yet too immature to provide a reliable description. According to Backeberg (1959), Y. Ito (1952(?) or 1957(?)) mentions this plant but as the texts are in Japanese, it has not yet been possible to investigate this further.

3. GYMNOCALYCIUM GIBBOSUM var. CAESPITOSUM Frič ex Fleischer, *Friciana* 4, C.24, pp. 3 - 5. 1964.

Diagnosis:

Caulis valde prolifer, capitibus maximis usque 9 cm. Costae usque 19, in statu juvenili pauciores. Costae 5 mm altae, supra areolam sulca interruptae. Infra areola tuberculum obtusum. Areolis paulum oblongis; aculei 5 - 7 raro aculeo centrali 10 - 12 mm longo. (Fleischer 1964).

Frič first used this name in 1926 when referring to plants he found in the Sierra Ventana, but he did not apparently publish a description. Fleischer (1964) who retains, in his collection of plants, cuttings of the original specimens brought back by Frič,

has described the variety in a Latin diagnosis as follows:

"Stem vigorously proliferating, largest head up to 9 cm. Ribs up to 19, fewer in the young state. Ribs 5 mm high, transected by grooves above the areoles. Below the areole a blunt tubercle. Areoles slightly oblong, spines 5 - 7, rarely a central spine, 10 - 12 mm long. Holotype in cultivation in the City of Brno." He also describes two forms from amongst the ten plants in his possession, namely forma intermedia (intermediate between var. caespitosum and the typically more spiny G. gibbosum species) and forma minima, based on its size relative to the other specimens. The same author maintains that these types have never been re-collected and are relatively rare. Backeberg (1959) would include these plants under var. leucodictyon Y. Ito.

4. GYMNOCALYCIUM GIBBOSUM var. CELSIANUM (Lab.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. CELSIANUS Hort. Paris, Förster-Rümpfer, Handbuch der Cacteenkunde, 2nd Edition, p.583, 1885.

ECHINOCACTUS CELSIANUS Labouret, In Schumann, Gesamtbeschreibung der Kakteen, p.409. 1898.

ECHINOCACTUS GIBBOSUS var. CELSIANUS Labouret, In Britton & Rose, The Cactaceae, Volume 3, p.158. 1922.

Earliest available description:

In der Blüthe abweichend. Diese ist 6 cm lang bei 5 cm oberem Durchmesser. Sepalen dunkelgrün, weiss gerandet, die unteren rund, die oberen oval. Petalen weiss, die äusseren mit einer grünlichen Mittellinie, die inneren schneeweiss, alle lanzettförmig. Staubgefässe sehr zahlreich, mit weissen Fäden und citron-gelben Antheren, von denen ein Theil eine den Griffel umgebende compacte Masse bilden. Griffel weiss, mit zwolftheiliger Narbe. (Rümpfer 1885).

This variety is listed by Putnam (1969) as "var. celsianus Labouret 1885". Labouret himself (1858) does not mention this variety at all and unless it was described elsewhere at the later date as stated, it would seem that it is Rümpler's second edition of Förster's earlier book, published in the same year, to which Putnam refers, although Rümpler, in fact, gives "var. celsianus Hort. Paris" and does not mention Labouret. Schumann (1898b) mentions a species Echinocactus celsianus Labouret (but refers to it as a variety!). as having been introduced into Paris in 1856, and which originated, according to a letter from Weber to Schumann quoted in his Gesamtbeschreibung (1898b), from the mainland opposite the Isla dos Leones in the region of Cabo dos Bahias, 45°S latitude. Britton & Rose (1922) quote "var. celsianus Labouret" giving incorrectly "Rümpler 1885" as a reference. Backeberg (1959) misinterprets Schumann's foot-note regarding the origin of the plant but also mentions that Ito (1957) had made a new combination, var. celsianum (Lab.) Y. Ito. Unless a description by Labouret can be found, it would appear that this variety should be recombined, quoting Rümpler rather than Labouret as author.

The variety derives its name from Cels, a well-known Cactus dealer in Paris who was contemporary with Labouret and who assisted him in writing his Monographie of 1858.

The only description at present available is that of Rümpler (1885) and it reads as follows: "This (variety) differs in the flower, which is 6 cm long and 5 cm in diameter. Sepals dark green, white bordered, the lower ones rounded, the upper ones oval. Petals white, the outer ones with a greenish mid-stripe, the inner ones snow-white, all lanceolate. Stamens very numerous with white filaments and lemon yellow anthers, some of them forming a compact mass around the style. Style white, with twelve lobed stigma."

5. GYMNOCALYCIUM GIBBOSUM var. CEREBRIFORME (Speg.) Y. Ito. Explanatory Diagrams of Austroechinocactanae p.190. 1957.

Synonym:

ECHINOCACTUS GIBBOSUS var. CEREBRIFORMIS Spegazzini, Nova addenda ad floram Patagonicam, in Anales de la Sociedad Cientifica Argentina, Buenos Aires, Volume 48, p.50. 1899.

Spegazzini (1899) first listed this variety having collected it on the banks of the Rio Negro near Carmen de Patagones in February 1895. It was said to be rather rare, growing together with the type of the species. He described it as a monstrose variety with considerably numerous, continuous, irregularly spiralled ribs, the areoles bearing short unequal spines. Although later mentioned by Britton & Rose (1922) and Backeberg (1959), it does not seem to have been written about or illustrated in more recent years.

6. GYMNOCALYCIUM GIBBOSUM var. CRISTATA Hort.

The existence of a cristate form of the species was recorded by Berger (1929) and a specimen is at present in the current author's reference collection.

7. GYMNOCALYCIUM GIBBOSUM var. CURVISPINUM

This is listed by Putnam (1969) as a nomen nudum of obscure origin.

8. GYMNOCALYCIUM GIBBOSUM var. FENNELII (Hge Jr.) Y. Ito, Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. FENNELII Hort. Grus. Schumann, Monatsschrift für Kakteenkunde, Vol. 8. p.143. 1898.

ECHINOCACTUS FENNELII Haage Jr. In Schumann, Gesamtbeschreibung der Kakteen, p.409. 1898.

ECHINOCACTUS GIBBOSUS var. FENNELII Haage Jr. In Monatsschrift für Kakteenkunde, Vol.9, p.115. 1899.

Earliest available description:

In der Katalogen begegnet man Echinocactus fennellii Fr.A.Hge., der ebenfalls mit der beschriebenen Art übereinstimmt, aber nur 11 Rippen besitzt. (Schumann 1898).

In view of the brevity of the above description, that of Quehl (1899) is also included here:

Körper saulenformig, blaulich grün, bei 10 cm. höhe, 5 cm durchmesser, bisher nicht sprossend; Scheitel in der mitte kaum eingesenkt, spärlich mit kurzem grauem wollfilz besetzt, aus dem hin und wieder ein einzelner Stachel hervorragt.

Rippen 13, durch seichte, wellige Längsfurchen und durch häufig tiefer als letztere gehende Querfurchen in vielkantige Höcker aufgelöst, unter den areolen kinnformig hervorgezogen, das Kinn oft durch eine zweite Querfurchen nochmals geteilt. Die Höcker, namentlich in Neutriebe, spitz, bis 8 mm hoch bei 6 mm durchmesser, später flacher und breiter. Areolen etwa 1 cm vonsinander entfernt, elliptisch, eingesenkt mit sehr kurtzen grauem Wollfilz bekleidet, bald verkahlend.

Rand stacheln 5 oder 6, hin und wieder oben noch 1 oder 2 kürzerer vom Körper schräg abstehend, gerade oder einzelne schwach gekrümmt, pfriemlich stechend, im Neutriebe braunrot, später hornfarbig, am Grunde rotlich. Mittelstacheln 0.

In Monatschrift für Kakteenkunde (1898a), Schumann is stated to have shown a specimen of Echinocactus gibbosus var. fennellii Hort. Grus. to a meeting of the German Cactus Society. Herman Gruson (1821 - 1895) from whose collection the plant presumably came, was the owner of one of the finest cactus collections in Europe during the latter half of the 19th Century. The only information given about the plant was that it had brown spines. In the same year, in his Gesamtbeschreibung (1898b), Schumann states that variety fennellii only differs from the type of the species by having eleven ribs. A year later, also in Monatschrift für Kakteenkunde (1899) one finds an article by Quehl giving some details of

the history of the plant. He states that: "In the possession of the firm of Fr. Ad. Haage Jr. in Erfurt, there is an old plant of this variety which the earlier proprietor of the firm had first introduced into the trade under the name Echinocactus fennellii, but had not described it."

Nicolaus Fennell, whose name the variety bears, Schumann records (1898b) was a nursery-man and market gardener in Cassel prior to his death in 1847.

The lack of a description is remedied by Quehl as follows: "Body columnar, bluish-green, up to 10 cm tall and 5 cm in diameter, up till now, not off-setting. Growing point only slightly depressed, bearing sparse short grey wool-felt, and here and there a single spine standing out. Ribs 13, broken up into many-sided tubercles by means of shallow wavy longitudinal furrows and by numerous deeper cross-furrows. Beneath the areoles, the tubercles are drawn out into "chins", these often once again divided by means of a second cross-furrow. The tubercles, especially when young, pointed, to 8 mm high by 6 mm in diameter, later flatter and broader. Areoles about 1 cm apart, elliptical, sunken, with very short grey wool-felt, soon becoming bare. Radial spines 5 or 6; now and again in addition at the top of the areole, 1 or 2 shorter ones standing out from the body obliquely, straight or occasionally slightly curved, awl-shaped, piercing, at first brownish-red, later horn coloured, reddish at the base. Centrals absent. Origin unknown but most certainly Patagonia."

It would seem therefore, that the original name should have been Echinocactus gibbosus var. fennellii Haage Jr. ex Quehl, and Ito's combination should be altered accordingly.

9. GYMNOCALYCIUM GIBBOSUM var. FEROX (Lab.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

9. (Cont..)

Synonyms:

ECHINOCACTUS GIBBOSUS var. FEROX Labouret, In Förster-Rümppler,
Handbuch der Cacteenkunde, 2nd Edition, p.583. 1885.

ECHINOCACTUS FEROX Labouret. In Monatsschrift für Kakteenkunde,
Volume 4, p.193. 1894.

GYMNOCALYCIUM FEROCIOR (?) Putnam, Synonymy, p.7. 1969.

GYMNOCALYCIUM GIBBOSUM var. NIGRUM forma FEROX (?)
In the J.D. Donald Collection.

GYMNOCALYCIUM FEROX var. NIGRA (?) Van Vliet, Chileans, Volume 3,
No.15, p.59. 1969.

Earliest available description:

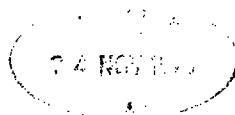
Körper kugelig, etwas breiter, als hoch, oben platt gedrückt.
Rippen 14, durch Höcker unterbrochen. Stachelpolster gewölbt,
wollig. Randstacheln 12 - 14, die Mehrzahl 2 - 3 cm lang, die 3 - 4
oberen bloss halb so lang. Mittelstacheln 2 - 3; alle mehr
oder weniger nach innen gebogen, anfangs blassbraun, später
grau. Blüten gross, weiss, prächtig. Staubfäden gelb. Griffel
weiss. (Rümppler 1885).

This variety is attributed to Labouret by Rümppler (1885) and
the following description is given: "Body spherical, somewhat
broader than high, depressed flat above. Ribs 14, broken up into
tubercles. Areoles convex (?), woolly. Radial spines 12 - 14, the
majority 2 - 3 cm long, the 3 - 4 upper ones only half as long.
Centrals 2 - 3, all more or less curved towards the centre, at first
pale brown, later grey. Flowers large, white, splendid. Stamens
yellow, style white."

Schumann (1898b) supposedly describing the same plant, agrees
more or less on rib number and spine length but describes the colour
of the young spines as straw yellow, red at the base, contrasting
with Rümppler's "pale brown, later grey". Britton & Rose (1922)

for some obscure reason, give a reference to *Monatsschrift für Kakteenkunde* (1894) which merely mentions the variety (as *Echinocactus ferox* Lab.) as being a desirable plant in any collection, while Berger (1929) give a brief description reminiscent of that of Schumann. Backeberg (1959) quotes Schumann verbatim, but gives the name as *Echinocactus gibbosus* var. *ferox* Lab. 1885. This is not correct, the year 1885 referring to Rümpler's mention of Labouret's earlier naming and not, as far as the present author can ascertain, to the actual description by Labouret. However, as mentioned earlier in connection with variety *celsianus* above, if Labouret's description cannot be traced, here too Y. Ito's combination of 1957 will have to be altered. Putnam follows Backeberg in this apparent error in his *Synonymy* (1969).

In *Monatsschrift für Kakteenkunde* (1891), a hybrid between *Echinocactus monvillei* and *Echinocactus gibbosus* var. *ferox* is described as follows: "Plant spherical, simple, flat at the top, dark green. Ribs 12, broken up into many tubercles, cut deeply and sharply above the areoles. Tubercles mammiform, keeled beneath the areole. Areoles oval, with short wool which is grey in colour. Spines rigid, sulphur yellow, red at the base. Radials 7 - 8, a little curved, standing apart from one another, of equal length; 2 - 3 more slender, shorter, inserted at the top of the areole. A single central spine, longer and straight. Flowers unknown." The plant was grown from seed produced by the pollination of an *E. monvillei* flower with pollen from *E. gibbosus* var. *ferox*, and showed the spination of *E. gibbosus* but the spine coloration of *E. monvillei*. The accompanying monochrome photograph shows a 4 year old plant grafted onto a *Cereus* stock and it must have measured about 10 cm in diameter. Its general appearance is certainly that of the male parent.



9. (Cont..)

Unfortunately this was given a specific name by Hildmann, the author of the above article, and was known as "Echinocactus contractus". Schumann (1898b) mentions the plant but gives the male parent as E. gibbosus species rather than var. ferox as in the original article.

Van Vliet (1969) writing about his collecting in Rio Negro and La Pampa provinces of Argentina, records finding "Gymnocalycium ferox var. nigra". To the best of the present author's knowledge this is a nomen nudum, but it is probably safe to assume that it is the same plant legitimately named G. gibbosum var. nigrum by Backeberg (1959) . The latter's plants originated from much the same area as did those of Van Vliet. Variety nigrum is dealt with more fully under that heading below.

Gymnocalycium ferocior is another name mentioned by Putnam (1969) and tentatively attributed to Backeberg, but further information is not at present available and it is therefore not possible to be certain whether the plant, if it exists at all, is correctly placed here.

A further complication is afforded by a plant under the name Gymnocalycium gibbosum variety nigrum forma ferox. This plant is said to have come from the Rio Chubut area of southern Argentina, and bears many spines up to 7.5 cm in length. A specimen is at present in the collection of J.D. Donald, Sussex, England. It could belong here, or under var. nigrum.

10. GYMNOCALYCIUM REDUCTUM var. FLAVISPINUM

According to Putnam (1969) this is a name of obscure origin and no further mention has so far been found in the literature. As this species is synonymous with var. nobilis, presumably, if it exists at all, this variety should become forma flavispinum under variety nobile. (Which see).

11. GYMNOCALYCIUM GIBBOSUM var. GERARDII Bodeker, nomen nudum.

Synonym: GYMNOCALYCIUM ESPOSTOA (?) Putnam Synonymy, p.7. 1969.

This varietal name is quite commonly seen in commercial lists and amateur collections but is very difficult to characterise. Backeberg (1959) referred to a plant seen under this name in Andreae's collection but seemed to be of the opinion that it was so close to the species itself that it was not practicable to separate it as a variety.

12. GYMNOCALYCIUM GIBBOSUM var. HYPTIACANTHUM (Frič) Y. Ito. Cacti, p.89.1952.

The variety was named by Frič in 1929. According to Backeberg (1959) it is only a name and belongs under G. gibbosum rather than G. hyptiacanthum. He implies that Y. Ito did not publish a description but once again this cannot be checked at present due to the lack of a translation from the Japanese.

13. GYMNOCALYCIUM GIBBOSUM var. LEONENSE (Hild.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. LEONENSIS Hildmann. In Schumann, Gesamtbeschreibung, p.409. 1898.

(Note possible synonymy with G. CHUBUTENSE)

Earliest Available Description:

Körper schlanker, mit einer geringeren Zahl von Rippen. (Schumann 1898)

This variety was mentioned by Schumann (1898b) and attributed to Hildmann. It differed from the type in that the body was more slender and possessed a smaller number of ribs. In a note following the description of Echinocactus gibbosus and its varieties, Schumann states that "Echinocactus leonensis Cels (non Hildmann) surely belongs here (i.e. under Echinocactus gibbosus), in spite of Rümpler's statement that this plant comes from Leon, capital of Nicaragua."

Unfortunately he does not say what distinguishes the variety leonensis from the species leonensis or whether he considers them to be identical.

13. (Cont..)

Spegazzini (1905) lists variety leonensis Cels and states that variety chubutensis Spegazzini (1902) is a synonym. Britton & Rose (1922) list the variety of Hildmann and the species of Cels separately but give no descriptions while Berger (1929) mentions only variety leonensis Hildmann and repeats Schumann's brief description. Backeberg (1959) suggests (with a query) that variety leonensis Hildmann and Echinocactus leonensis Cels are synonymous, in which case both become synonyms of Gymnocalycium chubutense Spegazzini (1925). For further discussion of this problem, see under G. chubutense.

14. GYMNOCALYCIUM GIBBOSUM var. LEUCACANTHUM (K. Sch.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. LEUCACANTHUS Hort. Förster-Rümppler, Handbuch der Cacteenkunde, 2nd Edition. p.583. 1885.

ECHINOCACTUS GIBBOSUS var. LEUCACANTHUS Rümppler, In Britton & Rose, The Cactaceae, Vol.3, p.158. 1922.

ECHINOCACTUS GIBBOSUS var. LEUCACANTHA Schumann, Gesamtbeschreibung, p.408. 1898.

ECHINOCACTUS GIBBOSUS var. LEUCACANTHUS Schumann, In Berger, Kakteen, p.220. 1929.

Earliest available description:

Rippen 14 - 16, höckerig. Stachelpolster gewölbt, länglich, tief eingesenkt, wollig. Randstacheln 7 - 8, der einzige Mittelstachel $1\frac{1}{2}$ - $2\frac{1}{2}$ cm lang, gerade abstehend, grau-weiße. (Rümppler 1885).

This variety is first mentioned by Rümppler (1885) as Echinocactus gibbosus var. leucacanthus Hort. He describes it as having 14 - 16 ribs which are tubercled. The areoles are convex (?), longish, deeply sunken, and woolly. Radials 7 - 8, the only central spine being 1.5 - 2.5 cm long, standing out straight, greyish white in colour. Schumann (1898b) mentions "variety leucacantha K. Sch. and gives

the following description: "More robust (than the type) with about 19 ribs, tubercles taller, sometimes square or six-sided, with shorter chin. Radial spines curved, flexible, whitish yellow, ruby coloured at the base, not only when young but also later." Britton & Rose (1922) give variety leucacanthus Rümpler but do not describe it, while Berger (1929) reverts to "variety leucacanthus K. Sch." and repeats the rib number and spine colour of Schumann. Backeberg (1959) favours Schumann as author of this variety and repeats Schumann's description in full. He also suggests that variety leucacanthus Rümpler might be a synonym of Schumann's plant, but unless further information comes to light, this problem cannot be resolved on the basis of the two descriptions quoted above.

15. GYMNOCALYCIUM GIBBOSUM var. LEUCODICTYON (K.Sch.) Y. Ito.
Explanatory Diagrams of Austroechinocactanae,
p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. LEUCODICTYON Schumann,
Gesamtbeschreibung. p.409. 1898.

GYMNOCALYCIUM GIBBOSUM var. CAESPITOSUM Fleischer & forms.
Possible synonymy suggested by Backeberg, Die Cactaceae,
Vol.3, p.1755. 1959.

Earliest available description:

Er ist kleiner und niedriger, reichlich sprossend, fast
bronzebraun. (Schumann 1898).

Schumann first described this variety (1898b) as "smaller and lower (than the type), freely off-setting and nearly a bronze-brown colour." Britton and Rose (1922) ignore this variety but Backeberg (1959) considers it worthy of retention and repeats part of Schumann's description, adding that a rather similar plant, that he had had sent to him in Europe, was dark blue-green, at first somewhat rounded and then off-setting. Plants seen in the Andreae

collection had somewhat more delicate ribs, usually seven radial spines and one central. He also considered that G. gibbosum variety caespitosum Fleischer should belong here also.

16. ECHINOCACTUS GIBBOSUS var. LEUCODICTYUS Salm-Dyck. Cacteae in horto Dyckensi Cultae, pp.34, 171. 1850.

Synonyms:

ECHINOCACTUS LEUCODICTYUS Hort. (Ibid)

ECHINOCACTUS GIBBOSUS Var. LEUCODYCTUS Salm-Dyck. In Labouret, Monographie des Cactées. p.253. 1858.

Earliest available description:

Characteribus omnibus revera ad eum accedit, et solum differt aculeis hucusque gracilioribus, basi atropurpureis et superne stramineis, nec brunneis. (Salm-Dyck 1850).

This variety was described by Salm-Dyck (1850) as differing from the type only in the spines which were more slender with dark purple bases and straw-coloured higher up instead of being brown. Labouret (1858) also lists it (mis-spelling the name) and repeats the brief description of Salm-Dyck. Rümpler (1885) reverts to the original spelling and again repeats Salm-Dyck's description. Schumann (1898b) places it in synonymy with the species and then sets up a different variety of his own under a very similar name - var. leucodictyon, dealt with under 15. above. Salm-Dyck's variety does not seem to have been seriously considered by more recent authors, Britton & Rose (1922) merely listing it as a variety and Backeberg (1959) making a passing reference only.

17. GYMNOCALYCIUM GIBBOSUM var. NIGRUM Backeberg, Die Cactaceae, Volume 3, p.1755. 1959.

(Note: Previously described by the same author, but without Latin diagnosis in Kaktus ABC, p.289, 1935. and Blätter für Kakteenforschung No.6. 1936.)

17. (Cont..)

Synonyms:

ECHINOCACTUS EBENACANTHUS Monville, sensu Labouret non Schumann,
In Labouret, Monographie des Cactées, p.253, 1858.

GYMNOCALYCIUM GIBBOSUM var. NIGRUM forma FEROX (?) J. D. Donald
Collection.

GYMNOCALYCIUM FEROX var. NIGRA (?) Van Vliet, Chileans,
Volume 3, No.15, p.59. 1969.

Diagnosis:

Differt a typo colore viridi nigrescente; aculeis nigris;
flore albo, fructu claviformi. (Backeberg 1959).

Backeberg (1959) describes the variety as differing from the type by its blackish-green body colour, about 6-7 completely black spines, white flower and club-shaped fruit. It came from the Rio Colorado, Argentina. He also suggests that this plant was perhaps the one described as Echinocactus ebenacanthus Monville. Labouret (1858) does indeed describe the ribs of this plant as "entirely similar to those of Echinocactus gibbosus" and later "the general characteristics are entirely similar to those of Echinocactus gibbosus" and yet again "entirely similar with respect to the flower as the preceding species" (E. gibbosus) while his Echinocactus ebenacanthus var. intermedius was "intermediate between this species and Echinocactus gibbosus". Schumann (1898b) however, although giving a reference to Labouret's plant, does not mention any resemblance to Echinocactus gibbosus and, in fact, mentions several times the presence of wool and bristles in the axils of the scales on the flower tube, thus eliminating any possibility of it being a Gymnocalycium. On the other hand, Labouret implies that the flowers lacked wool and bristles and so he could well have been mistakenly describing a specimen of Gymnocalycium gibbosum var. nigrum under the name of Echinocactus ebenacanthus.

The other two plants listed as synonyms above are nomina nuda and could possibly belong here. (See also under variety ferox).

18. GYMNOCALYCIUM GIBBOSUM var. NOBILE (Monv.) Y. Ito, Cacti. p.88, 1952. (Comb.nud.). Explanatory Diagrams of Austroechinocactanae, p.189, 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. NOBILIS Monville, In Lemaire, Cactearum Genera Nova, Speciesque novae, p.91. 1839.

ECHINOCACTUS NOBILIS Hort. Kew. In Labouret, Monographie des Cactées, p.253, 1858.

ECHINOCACTUS NOBILIS Haworth Philosophical Magazine, Edinburgh Vol.7, p.115. 1830.

CACTUS NOBILIS Haworth, Synopsis Plantarum Succulentarum, p.174. 1812.

GYMNOCALYCIUM REDUCTUM Pfeiffer, Abbildung und Beschreibung Blühender Cacteen, Plate 12, 1847.

Diagnosis:

Robustior, aculeis validioribus, longioribus, junioribus atro-violaceis; cuticula multo intensius atro-virenti. (Lemaire 1839).

Lemaire (1839) briefly describes this variety as being more robust than the type, and having larger longer and stronger spines which appear dark violet -when first emerging while the plant body is a much more intense dark green.

Labouret (1858) mentions Echinocactus gibbosus var nobilis and gives the author as Monville. He also places Echinocactus nobilis Hort. Kew (found as Cactus nobilis in Haworth (1812) and Echinocactus nobilis in Haworth (1830)) and Gymnocalycium reductum Pfeiffer (1847) in synonymy with this variety. It should be noted that Cactus nobilis and Echinocactus nobilis are sensu Haworth, non Willdenow, Species plantarum Vol.2, p.939 or Hortus Kewensis Edition 2, Vol.3, p.175.

Labouret describes the plant as having a dark shining green body, spines more sturdy than the type, larger, (the longest about 36 - 40 mm), the youngest of a darker colour, sometimes a bright brown. The wool of the areoles was white; that at the base of the longer spines more persistent. The lobes of the perianth were very pointed (acuminate), the filaments of the stamens hair-like, and the anthers very small. It possessed only 13 ribs and attained a height and diameter of 10 cm.

The description of the stamens given by Labouret leads one to suspect that the specimen in question was male sterile, a phenomenon not unknown amongst other members of this genus.

Labouret also claims that Pfeiffer described "the same plant under the name of Gymnocalycium reductum" and gives his version of Pfeiffer's description, but the present author cannot find the reference to the stamens being in two whorls in either the French or the German version of Pfeiffer in his publication of 1847. It would perhaps come from the catalogues produced in the years 1843 and 1844 of the Cacti in the collection of Herr A. Schelhase (a market gardener in Cassel who had specialised in these plants) and to which Pfeiffer had contributed. It has so far not been possible to trace copies of these catalogues. Rümpler (1885) more or less repeats Labouret's description of the variety. For some obscure reason Backeberg (1959) changes the original author of variety nobilis to Haworth although noting at the same time that Ito gives Monville. Inspection of the literature shows Monville to be correct.

19. ECHINOCACTUS GIBBOSUS var. NOBILIS sensu Schumann, Gesamtbeschreibung p.408. 1898.

First Description:

Dicker, mit ca. 19 Rippen; Höcker höher, oft ziemlich deutlich sechsseitig, mit starkem Kinnvorsprunge; Areolen viel grösser (bis 12 mm lang); Randstacheln sehr zahlreich (bis 15), Mittelstacheln bisweilen bis 6, alle schön weiss, am Grunde rubinfarbig, gerade, bis 35 mm lang, biegsam. (Schumann 1898).

Schumann (1898b) although using the same varietal name, adds his own name as author and the description which follows it does not resemble that of Labouret at all. Schumann certainly had a different plant in mind. He describes it as follows: "More robust, with about 19 ribs, tubercles taller, moderately clearly six-sided, with strongly outstanding "chins". Areoles much larger, up to 12 mm long. Radial spines very numerous (to 15), centrals occasionally to 6, all handsome, white, ruby-coloured at the base, straight, up to 35 mm long, flexible." Berger (1929) gives "variety nobilis K.Sch." and the description, such as it is, follows that of Schumann. Backeberg (1959) makes the quite unjustified assumption that the variety nobilis of Labouret was the same as that of Schumann, apparently ignoring the fact that the latter author had placed Cactus nobilis Haworth and Echinocactus nobilis Haworth in synonymy with Echinocactus gibbosus. From what has gone before, it follows that the plant referred to as variety nobilis K.Sch. now requires renaming.

Backeberg (1959) also mentions a plant, variety nobilis Aff. which he received amongst imported plants and whose spines were likewise more numerous and at first, golden brown. This may possibly belong here or alternatively could be the plant referred to by Monville.

20. GYMNOCALYCIUM GIBBOSUM var. PLURICOSTATUM (Först.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonym: ECHINOCACTUS GIBBOSUS var. PLURICOSTATUS Hort. Förster-Rümppler, Handbuch der Cacteenkunde, 2nd Edition, p.584. 1885.

First Description:

....mit einer grösseren Anzahl von Rippen. (Rümppler 1885)

Rümppler (1885) seems to be the first to mention this variety as variety pluricostatus Hort., but his description is very brief, consisting of the statement that the plant possesses a larger number of ribs than the type. Schumann (1898b) omits any mention of the plant, but the reference to Rümppler is listed by Britton & Rose (1922).

20. (Cont..)

Backeberg (1959) mentions Ito's new combination but no further details are given.

21. GYMNOCALYCIUM GIBBOSUM var. POLYGONUM (K. Sch.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonym: ECHINOCACTUS GIBBOSUS var. POLYGONA Schumann, Gesamtbeschreibung, p.409. 1898.

First Description:

Körper schlanker, aber vielrippig; Höcker nicht stark vorspringend. (Schumann 1898).

This was described by Schumann (1898b) as having a more slender body than the type but with many ribs and the tubercles not strongly protruding. It appears in the list of Britton & Rose (1922), and Backeberg (1959) also mentions it, repeating the description of Schumann.

22. GYMNOCALYCIUM GIBBOSUM var. REDUCTUM

This variety appears in Putnam's Synonymy (1969) as a nomen nudum of unknown origin. It would seem very probable that this variety originated from Gymnocalycium reductum Pfeiffer when this old species was made synonymous with G. gibbosum and/or G. gibbosum var. nobile, and hence has no real validity whether or not it has been somewhere described.

23. GYMNOCALYCIUM GIBBOSUM var. ROLFIANUM

Another variety listed in Putnam (1969) as a nomen nudum and about which nothing further seems to be known.

24. ECHINOCACTUS GIBBOSUS var. ROSEIFLORUS Hildmann

Backeberg (1959) lists this variety, apparently a pink-flowering variant of the species, which had been mentioned to him by Bozsing, but reports that he could find no record of it in Schumann (1898b) or Britton and Rose (1922). In addition Rümpler (1885), Labouret (1858) Salm-Dyck (1850), Förster (1846) and Haworth (1812) have been found to make no mention of it either.

25. GYMNOCALYCIUM GIBBOSUM var. ROSTRATUM Fleischer, Friciana Rada 4, C 24, p.5. 1964.

Diagnosis:

Forma lata, paulum prolifera, 14 cm lata et 12 cm alta. Vertex planus haud impressus. Costae 28, valde typicae. Sulca transversalis planissima; ab ea ripa linearis usque 22 mm longa continuens; ibique areola 1 cm longa et 3 mm lata. Inde costa angulo acuto reflexa tuberculum rostratum usque 1 cm altum formans.

Aculei in areola laterales 9, centrales 4, parum inter se distantes, radiales et lateraliter divergentes; aculeus longissimus 6 mm longus.

Varietas valde typica multitudine costarum, tuberculis rostratis, areolis longitudinalibus atque caulibus parum proliferis. (Fleischer 1964).

This was described by Fleischer (1964) from a single plant said to be vegetatively propagated from material collected in habitat by Frič in 1926, in the Sierra Ventana, Argentina. Fleischer's account of the plant is as follows: "A broad form, proliferating a little, 14 cm wide and 12 cm in height. Stem apex flat, not depressed at all. Ribs 28, quite typical (?). Cross-furrows very shallow; from each emerges a long straight ridge up to 22mm in length upon which is the areole, 1 cm long and 3 mm wide. Then the rib is sharply reflexed forming a beaked tubercle up to 1 cm in length. There are nine lateral spines and four centrals in each areole, with very little between them (?), radiating and diverging laterally; the longest spine is 6 mm in length. The variety is characterised by the large number of ribs, the beaked tubercles, the longitudinal areoles and by the rarely proliferating plant body.

It would appear that no further material has ever been imported into Europe.

26. ECHINOCACTUS GIBBOSUS var. SCHLUMBERGERI Rümpler, Förster's Handbuch der Cacteenkunde, 2nd Edition p.584. 1885.

Synonym: ECHINOCACTUS GIBBOSUS var. SCHLUMBERGERI Hort. (Ibid)

First Description:

Rippen 12 - 14, höckerig, wenig vorspringend. Stachelpolster gewölbt, eingesenkt, länglich, schwach mit Wolle besetzt. Stacheln 1 bis 2 cm lang, abstehend, bräunlich, später grau. Randstacheln 8 - 10, die oberen 2 kürzer. Mittelstacheln 1 - 2. Blüten ähnlich denen der var. ferox, aber bedeutend grösser. (Rümpler 1885).

This variety was described by Rümpler (1885) under the name "variety schlumbergeri Hort.", as follows: "Ribs 12 - 14, tubercled, somewhat projecting, Areoles convex (?), sunken, longish, bearing sparse wool. Spines 1 - 2 cm long, standing out, brownish, later grey. Radials 8 - 10, the upper two shorter. Centrals 1 - 2. Flowers similar to those of variety ferox but considerably larger." The plant was named after F. Schlumberger, a wealthy gentleman who had a very large cactus collection on his estate at Pont de l'Arche, Normandy.

27. GYMNOCALYCIUM GIBBOSUM var. SCHLUMBERGERI (K.Sch.) Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS GIBBOSUS var. SCHLUMBERGERI Schumann,
Gesamtbeschreibung, p.408. 1898.

ECHINOCACTUS SCHLUMBERGERI Cels In Schumann,
Gesamtbeschreibung, p.409. 1898.

First Description:

Dünnere, mit 13 - 14 Rippen, Höcker niedrig, von fast quadratischem Umriss; Stacheln derb, 15 - 22 mm lang, gerade, nicht biegsam, rosenrot bis hornfarben. (Schumann 1898).

Schumann (1898b) first described this variety, utilising Rümpler's varietal name, changing the description and adding his

29. GYMNOCALYCIUM GIBBOSUM var. VENTANICOLUM (Speg.) Y. Ito, Explanatory Diagrams of Austroechinocactanae, p.190. 1957.

Synonyms:

ECHINOCACTUS OTTONIS Spegazzini (non Lehmann), Notes Synonymiques, In Anales del Museo Nacional de Buenos Aires, Series 3, Volume, 2, p.7. 1903.

ECHINOCACTUS SPEGAZZINII Weber. Ibid.

ECHINOCACTUS GIBBOSUS var. VENTANICOLA Spegazzini. Ibid.

ECHINOCACTUS OTTONIS Spegazzini (non Link & Otto)
Cactacearum Platensium Tentamen, In Anales del Museo Nacional de Buenos Aires, Volume 11, Series 3, part 14, p.503. 1905.

Original Description:

This has so far not been traced. Spegazzini himself refers to "Flora Sierra Ventana, p.27. No.95a" in his Notes Synonymiques (1903) and to "Contr. Estud. Fl. Sierra Ventana, p.27" in Cactacearum Platensium Tentamen (1905) but the copy of the Contribucion in the present author's possession has no reference to E. ottonis Speg. on page 27, nor does item 95a appear. The only possibility seems to be the existence of a revised version of the Flora but so far this has not come to light.

Apparently, Spegazzini first published the description of this plant under the name Echinocactus ottonis Speg. (non Lehmann). As there was already an Echinocactus ottonis (now Notocactus) in existence at the time, the choice of name is difficult to understand. In a later publication (1903) Spegazzini states that he then considered it "simply a pretty variety of Echinocactus gibbosus D.C. because of its white or pink petalled flowers which are glabrous, its whitish styles and because of its general habit; I propose to call it Echinocactus gibbosus D.C. var. ventanicola Speg." Later still, (1905), giving the synonym Echinocactus ottonis Speg. (non Link & Otto) - previously it had been designated "non Lehmann" - he describes the variety as follows:

29. (Cont..)

"Plant body elliptico - globose (60 - 120 mm high and in diameter) somewhat ashy-grey-green, ribs 13, regularly thickened, tuberculate, vertical; areoles elliptical, 10 - 12 mm apart; spines 12 - 18 (5 - 20 mm long), of which 3 - 5 are centrals, scarcely longer and slightly bulbous at the base, where the colour is purplish grey, upwards the colour is translucent pale yellowish-brown; flowers upright, 50 - 55 mm long."

He concludes by mentioning that, in a letter to him, Weber expressed the opinion that it was a species in its own right and wished to name it Echinocactus spegazzinii. This specific name is now applied to a very different member of the genus, so presumably Weber's name was never validly published.

Spegazzini also points out that Schumann "refers it, (variety ventanicola), on the contrary, to De Candolle's type." (meaning presumably, the species gibbosus). Reference to Schumann's Gesamtbeschreibung reveals no statement to this effect but it may well have been made elsewhere or even verbally when Spegazzini visited Europe and met Schumann and other leading cactus enthusiasts in 1892. Britton & Rose (1922) list the variety as a synonym of Gymnocalycium gibbosum but without giving reasons and Y. Ito disregarded this fact when making his new combination in 1957. Backeberg (1959) maintains that this is "only a name" and is not widely known.

Habitat:

Early writers give completely inaccurate habitat details ranging from Mexico, Guatemala, Nicaragua (var. leonense) to Jamaica. Labouret (1858) seems to be the first to record that specimens of Echinocactus gibbosus had reached the dealer Cels in Paris from the

Isla dos Leones off the coast of Patagonia, S. Argentina. However, as the statement appeared only on the very last page of the book under "Corrigenda", it seems to have been missed and it was Schumann (1898b) who clarified the position and placed the location of the species once and for all in the correct Hemisphere.

The overall distribution of this species (*sensu lato*) is certainly a very wide one. The most northerly area quoted is Cordoba (Spegazzini 1905) but as, over the years, this author was rather confused as to what he meant by Echinocactus gibbosus, perhaps the record should be treated with some caution. In the neighbouring province of San Luis, which borders Cordoba towards the west, Herr Borth (1973) reports the finding of plants which "I believe ... belong to the Formenkreis of G. gibbosum and that ... spatially (?) they are an intermediate of the G. gibbosum type." It has so far been impossible to check, but it seems highly likely that some, at least, of the plants referred to have been described as Gymnocalycium striglianum. This plant was stated (1973) to be a member of the *Ovatisemineae* Group and its origin was given as the province of Mendoza which borders on San Luis, again to the west. The account is geographically rather vague but some of Borth's discoveries could well have been just over the border in Mendoza. The barrier of the Andes limits any further spread westwards but to the south-east of Cordoba lies the province of Buenos Aires (bordering on the Atlantic Ocean) and immediately to the south of Mendoza and San Luis lie the provinces of La Pampa, Rio Negro, Chubut and finally Santa Cruz, all of which have been recorded at one time or another as sources of

29. (Cont..)

the species (or its numerous varieties). The most southerly limit would seem to be in the region of 48° S latitude. (Descole 1943).

In more specific terms, Schumann (1898b) quoting Dr. Weber, lists E. schlumbergeri Cels and E. celsianus Labouret from the region of Cabo dos Bahias, province of Chubut, on the mainland opposite the Isla dos Leones; E. leonensis Cels from the island itself; E. towensis Cels from the island of Towa (or Tova as it now appears to be called) which lies just to the west of Leones along the coast; and E. gibbosus D.C. from the mouth of the Rio Chubut. Spegazzini (1899) claimed that E. gibbosus was common in the whole of the altiplano along the Rio Negro near Carmen de Patagones when first discovered there in 1895. Frič is said, in 1926, to have found G. gibbosum variety caespitosum in the Sierra Ventana, a range of hills quite close to the coast north of Bahia Blanca, while he also found G. gibbosum variety schlumbergeri near Carmen de Patagones, and occasionally near the Rio Negro and San Antonio. Descole (1943) illustrates a form of G. gibbosum from the Islas Vernacci, in the Bahia Bustamente, province of Chubut, not much further south than Isla dos Leones and the island of Tova. Backeberg (1959) states that his G. gibbosum variety nigrum comes from "Rio Colorado". The river Colorado runs for over 800 Km from the Andes to the Atlantic, so the location is vague to say the least, unless the double town (half on one side of the river and half on the other) of Rio Colorado is intended, in which case the locality is just under 200 Km upstream from the coast. The presence of the species in mountainous areas in the province of Buenos Aires is confirmed by Cabrera and Fabris (1965) and also from Bahia Blanca

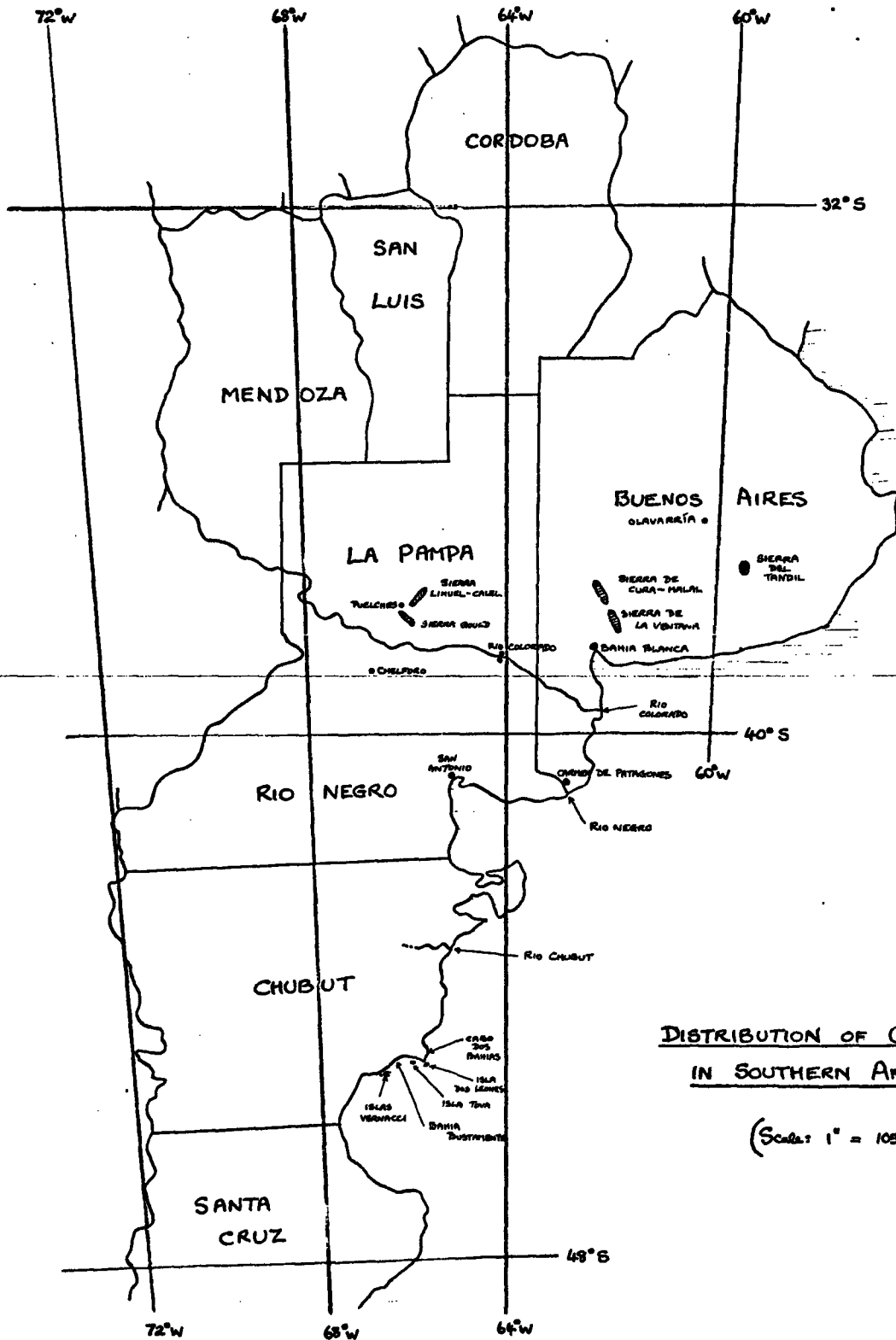
... Cura Malal is one locality mentioned specifically by

these authors. The plant "G. ferox variety nigra" of Van Vliet (1969b) seems very likely to be the same as G. gibbosum variety nigrum of Backeberg. Van Vliet found it growing under bushes in the Serra (sic) Gould near Puelches, province of La Pampa and again at Chelforo, province of Río Negro. A rather similar plant but much smaller, with weaker spines and a long turnip-like root was found by the same collector in the Serra (sic) Lihuel-Calel, whose highest point is 400 m.

Map References:

CABO DOS BAHÍAS	65°30'W	44°56'S)	
ISLA DOS LEONES	65°35'W	45°03'S	)	Sheet L19
ISLA TOVA	66°00'W	45°06'S	)	COMODORA
BAHÍA BUSTAMENTE	66°30'W	45°07'S	)	RIVADAVIA
ISLAS VERNACCI	66°30'W	45°11'S)	
RÍO CHUBUT (Mouth of)	65°04'W	43°20'S)	
RÍO NEGRO (Mouth of)	62°46'W	41°02'S	)	Sheet K20
CARMEN DE PATAGONES	62°59'W	40°47'S	)	GOLFO SAN
SAN ANTONIO	64°56'W	40°44'S	)	MATÍAS
SIERRA VENTANA	61°58'W	38°10'S)	
BAHÍA BLANCA	62°17'W	38°44'S)	
RÍO COLORADO (Mouth of)	62°07'W	39°44'S	)	Sheet J20
CURÁ MALAL	62°13'W	37°49'S	)	BAHÍA BLANCA
SIERRA GOULD	65°48'W	38°17'S)	
PUELCHES	65°53'W	38°08'S)	
SIERRA LIHUEL-CALEL	65°37'W	38°02'S)	
CHELFORO	66°32'W	38°02'S	)	Sheet J18/19 CONCEPCIÓN-NEUQUÉN

When one considers that the plant has been known in cultivation in Europe for well over 150 years, it is remarkable that its habitat is so sketchy and ill-defined.



DISTRIBUTION OF G. GIBBOSUM
IN SOUTHERN ARGENTINA.

(Scale: 1" = 105 miles)

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GYMNOCALYCIUM CHUBUTENSE (Speg.) Spegazzini

Nuevas notas Cactológicas. In Anales de la Sociedad Científica Argentina. Volume 99, p.135. 1925.

Synonymy:

ECHINOCACTUS GIBBOSUS D.C. var. CHUBUTENSIS Spegazzini.

Nova addenda ad floram Patagonicam.

In Anales del Museo Nacional de Buenos

Aires. Volume 3, p.285. 1902.

ECHINOCACTUS GIBBOSUS D.C. var. LEONENSIS Cels (Sensu Speg.)

Spegazzini: Cactacearum Platensium Tentamen

In Anales del Museo Nacional de Buenos Aires.

Volume 11, p.504. 1905.

NOTE: It is assumed by the present author that ECHINOCACTUS LEONENSIS Cels is also a synonym. This may be merely a catalogue name, as so far no description has been traced in the literature.

Original description:

Varietas a typo recedens statura semper humili, colore intense subcinereo-glaucos, spinis minus numerosis et floribus conspicue majoribus.

Cormus saepius solitarius, rarius prolifero-caespitosus, vix terra emersus deorsum eximie conoideus (5 - 10 cm long) sordide fuscescens transversim irregulariter rugoso-subtuberculosus inermis in radice sordide ochraceo-albida longiuscula (15-30 cm long - 5-10 mm crass.) cylindracea [†]ve ramosa productus, superne e viridi v. avellaneo plumbeo-glaucus truncato-applanatus centro non v. leniter depressus glaberrimus, costis 12 - 13 obtusis sinibus parum profundis vix acutis separatis, tuberculis centralibus junioribus (ad medium discum usque) parvis acute atque eximie limitatis exareolatis inermibusque, ceteris peripheriam versus sensim majoribus magis applanatis ac [†]ve confluentibus semper obsoletissime

gibbosis, areoliferis et spiniferis; areolis e discoideo subellipticis (3 - 4 mm diam.) cinereo-velutinis saepius infossis; spinis quandoque radiantibus adpressis 5 - 6, quandoque altera centrali erecta addita, omnibus subteretibus rectis primo cinereis furfurellis dein atris subglabratis apice acutis pallidioribus (5 - 20 mm long. = 0.6 - 1.0 mm crass.) basi non v. vix incrassatulis. Flores ex areolis submarginalibus saepius solitarii majusculi (85 mm alt. = 40 mm diam.), ovario leniter clavulato parum distincto (24 mm long. = 12 - 14 mm diam.) parietibus sectis intus non v. vix parcissime violascentibus, extus glaberrimo obscure viridi-glaucoscente, squamis (circ.12) remotiusculis arcte adplicitis semiorbicularibus dorso convexulis saepeque gibbosulis margine subroseo-hyalinis obtusissimis integerrimis, superne sensim majoribus et elongatis ac in phyllis transeuntibus; phyllis 6 - 7 stichis, extimis carnosulis virescentibus v. sordide rubicundis, intimis spathulatis integris v. vix denticulatis ac mucronatis (45 mm long. = 15 mm diam.); staminibus obscure biseriatis, filamentis (12 mm long.) albis v. albo-virescentibus, antheris ochroleucis- stylo tereti erecto (25 mm long. = 3 mm crass.) albo apice laciniis stigmaticis circ. 10(5 - 6 mm long.) ornato; fructo ignoto. (Spegazzini 1902).

This species was first described, as far as one can ascertain from the literature, by Spegazzini (1902) as a new variety of Echinocactus gibbosus. However, in a later publication (1905) he places it in synonymy with E. gibbosus var. leonensis Cels, so that there is a possibility of an earlier description. Cels was a famous Parisian cactus dealer, grandson of an equally famous one whose business he carried on until his own death in 1806. Whether he wrote about the variety or merely sold plants under that name, has yet to be determined, but it would seem strange that Spegazzini should bother to publish the synonymy if he had

no definite description to work on, especially considering the lapse of nearly 100 years and the great unlikelihood of plants named by Cels surviving for this period of time, so that Spegazzini might be conversant with them. In the literature investigated to date, it appears that some confusion exists in authors' minds regarding who was responsible for the naming of the variety (or varieties) leonensis. Both Hildmann and Cels are quoted as authors and Backeberg (1959) tentatively suggests that there was only one plant in question, not two. However, Schumann (1898) clearly differentiates between E. Gibbosus var. leonensis Hild., which he describes briefly as having "a body more slender, with a smaller number of ribs" (compared with the type) and the species E. leonensis Cels. Unfortunately he does not describe the later but it must seem unlikely that Spegazzini (1925) would later constitute a new species (G. chubutense) from a plant differing so slightly from the type of G. gibbosus as variety leonensis Hildmann.

Rümppler (1885) does describe an Echinocactus leonensis but without giving an author. Presumably it is the plant referred to by Schumann above. It is said to be spherical with a flattened apex, dark green in colour with reddish brown on the ribs which number between 14 and 16. They are blunt, tubercled and bear areoles which are longish, arched (?), woolly, and somewhat sunken. The radial spines are 8 in number, 1 cm long and standing out from the plant body. Central spines one, standing out from the body like the radials. Both radials and centrals are brown on first appearing, later becoming whitish-grey.

If one compares this description with that of Spegazzini for G. chubutense, the body shape is seen to be similar, the brownish tinge

to the body is common to both, and there are also common features between the areoles of the two plants, while both have central spines, at least in the mature state. On the other hand, the rib numbers are different and spine colour and number markedly so. (See table).

However, until more conclusive evidence comes to light, one can only assume that this was indeed the plant Spegazzini had in mind, and that he referred to it, in error, as E. gibbosus variety leonensis Cels instead of Echinocactus leonensis Cels.

Britton & Rose (1922) include E. gibbosus chubutensis Speg. as a synonym of G. gibbosum, but Backeberg (1959) states that Hosseus, who would appear to have seen G. chubutense in habitat, accepted it as a valid species, while Backeberg himself does likewise, both here and in his Lexikon (1965). At the present time, this plant does not appear to be common in European collections though seed of unknown origin is sometimes offered by dealers.

Description: The following description is based on Spegazzini's original description (1902) supplemented by his publications of (1905) and (1925). The stem is often solitary, more rarely branching or proliferating, barely extending above soil level. Below ground the plant is almost conical, 5 - 10 cm long, dingy greyish-brown, with irregular transverse wrinkles, almost tuberculate, lacking spines. The root is dingy yellowish-brown to white, moderately long (15 - 30 cm long and 5 - 10 mm broad) cylindrical and somewhat branched. Above ground level the plant body is green or nut-brown glaucous-grey, flattened hemispherical in shape, flat topped, the apex not depressed or only slightly so, glabrous, (50 - 150 mm tall and 50 - 100 mm in diameter). There are 12 - 13 ribs, somewhat irregular and slightly tuberculate,

Table comparing E. leonensis Cels and G. chubutense (Speg.) Speg.

FEATURES	<u>ECHINOCACTUS</u> <u>LEONENSIS</u> Cels.	<u>GYMNOCALYCIUM</u> (<u>ECHINOCACTUS</u>) <u>CHUBUTENSE</u> etc.			
	RÜMPLER 1885	SPEGAZZINI 1902	SPEGAZZINI 1905	SPEGAZZINI 1925	BACKEBERG 1959 & 1965
BODY	Body spherical with flattened apex.	Flat topped. Cylindrical (?)	Depressed hemispherical.	-	Broadly rounded, apex depressed.
COLOUR	Dark green with reddish brown on ribs.	Green or nut-brown glaucous-grey.	Dark glaucous and dark brownish-green.	-	Chalky, ashy-grey-green.
RIBS	Ribs 14 - 16, blunt, humped.	Ribs 12 - 13 always with rudimentary humps.	Ribs 12 - 13 somewhat irregular, slightly tuberculate.	-	Ribs up to about 15, flat and broadened with sharp chinned tubercles
AREOLES	Areoles longish, arched (?), woolly, somewhat sunken.	Areoles circular to elliptical more often sunken. Ashy-grey, velvety.	Elliptical.	-	Somewhat sunken, longish-roundish.
RADIALS	Radial spines 8, 1 cm long, standing out from the body, at first brown, later whitish-grey.	Radial spines 5 - 6.	Radial spines 5.	-	Radial spines 5 - 7, 4 cm long, standing out from the body.
CENTRALS	Central spines 1, out-standing from the body as for radials.	Centrals sometimes present. (No numbers given).	Centrals 1.	Centrals in older areoles only.	Centrals absent or rarely 1 in older areoles.
SPINE COLOUR	Brown at first, later whitish-grey.	At first ashy-grey covered with bran-like scales. Later black.	Dark brownish black with paler tip.	-	Chalky (mealy ?) blackish grey.

separated by not very well-defined furrows. The younger, central tubercles, (as far as halfway to the edge of the disc) small, sharp, differing markedly in lacking areoles and spines. The remainder, towards the periphery, gradually become larger, more completely flattened and more or less confluent, always bearing rudimentary "chins" and possessing areoles and spines. The areoles are circular to somewhat elliptical (3 - 4 mm in diameter) and bearing ashy-grey velvet, usually sunken into the rib. The spines are sometimes all radial 5 - 6 in number, appressed, but sometimes erect centrals are produced later. (In 1905, Spegazzini alters this, saying of the spines that there were 5 radials and the sixth, if present, is a central.) All spines are almost circular in cross-section, straight, at first ashy-grey, covered with bran-like scales, then later becoming black, almost glabrous, sharply pointed and having a paler tip, (5 - 20 mm long by 0.6 - 1.0 mm in diameter), scarcely, if at all, thickened at the base. The flowers arise almost from the edge of the disc, usually solitary, quite large, (85 mm tall & 40 mm in diameter). (In 1925, Spegazzini gives flower height as 90 mm). The ovary is not very distinct (24 mm long by 12 - 14 mm in diameter) and slightly club-shaped. (In 1925 Spegazzini stated 30 mm long, about $\frac{1}{3}$ total height of the flower.) The inner surface of the wall is sometimes slightly violet coloured; the outside is glabrous and a dark glaucous green. The scales number about 12, somewhat scattered, lying close to the tube, semicircular, somewhat convex on the outer surface and often somewhat humped, with a slightly pinkish to colourless margin. They are very blunt, edges completely entire, upwards gradually becoming larger and elongated and transformed into petals. The perianth tube is relatively short (20 mm). The petals are in

6 - 7 whorls, the outermost somewhat fleshy, greenish, or dingy reddish, the inner ones spathulate, entire or slightly denticulate and mucronate. The intermediate perianth segments are the largest (40 mm x 15 mm in width) but more blunt. The innermost ones are shorter and acute. The stamens are arranged in two groups separated by a narrow ring 4.5 mm wide, their filaments (12 mm long) white or greenish white, with anthers pale ochre in colour. The style is cylindrical, erect (25 mm long and 3 mm in diameter) and white in colour. It exceeds the anthers of the uppermost stamens by its stigma which has 10 pale yellow lobes, each 5 - 6 mm long. The fruit is unknown.

Backeberg (1959) omits any mention of the reddish-brown tinge in the body colour and describes the apex as "depressed". He reverses the overall dimensions of the plant making it up to 150 mm in diameter (instead of height) and 100 mm in height (instead of diameter) though adding that it may elongate later. The rib number is increased from 12 - 13 up to "about 15". The slightly elliptical areoles are now said to be 6 mm long (instead of 3 - 4 mm) with a sharp oblique groove (above ? G.J.S.) and a sharp chinned tubercle beneath. Radial spines are said to be 5 - 7 (instead of 5), robust, rigid, and standing out from the body. All the spines are described as somewhat flattened and frequently prominently grooved, somewhat backwardly bent, up to 4 cm long, and chalky greyish-black in colour. About the only points of agreement are on the lack of any thickening at the base of the spines and the fact that a central spine is sometimes produced in the older areoles.

There would appear to be some doubt as to whether Backeberg's description and that of Spegazzini are, in fact, referring to one and the same species. Consequently the plant description quoted earlier has been based exclusively on Spegazzini's work and has not been modified in the

light of Backeberg's much later publications.

Habitat:

In the original publication (1902) Spegazzini states that the plant was "frequent in the dry regions along the Río Chubut". Later he extends the distribution (1925) to the desert regions of the provinces of Santa Cruz and Chubut and describes the plant as being of only "fairly frequent" occurrence. According to Backeberg (1959) Hosseus had seen this plant in habitat at Hacienda Teutonia near the Cabo Raso in Chubut province and is recorded as stating that it was found on almost inaccessible rocks, making collection difficult. Backeberg (1965) gives merely "Argentina (Chubut)". The Rio Negro has also been mentioned as a possible habitat for this plant but reliable documentary evidence is lacking at present.

It is interesting to note that this ^{taxon} plant is amongst the most southerly representatives of the genus Gymnocalycium. Descole (1943) giving the southern limit of the distribution area for the genus as 48°S, which includes approximately one third of the province of Santa Cruz.

Map References:

CARMEN DE PATAGONES	62°59'W	40°47'S
HACIENDA TEUTONIA	65°31'W	44°22'S

Sheets: K20 - GOLFO SAN MATÍAS
and
L19 - COMODORO RIVADAVIA

(FOR SKETCH MAP, SEE UNDER G. BRACHYPETALUM.)

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GYMNOCALYCIUM BRACHYPETALUM Spegazzini

Nuevas Notas Cactológicas, In Anales de la Sociedad Científica Argentina, Volume 99, p.135. 1925.

Synonymy: ECHINOCACTUS BRACHYPETALUS (Speg.) Werdermann

(Date and place of publication unknown at present). Backeberg in Neue Kakteen 1931, p.89 gives this combination, so that this narrows the possible time to the years between 1925 - 1931.

(But see page 1 of G. andreae).

Diagnosis:

Cormus teres erectus, obscure viridi-glaucescens, costis 13, undulato-gibbosis, sinu profundiusculo acuto flexuoso separatis, tuberculis triangulari obovatis, antice subtruncato-rotundatis, inferne acutiuscule acute prominulis; areolis ellipticis impressis vix cinereo-velutinis, 5 - 7 spinosis, spinis tereti-attenuatis, gracilibus rigidis, omnibus plus minusve divaricatis radiantibus, saepius leniter sursum incurvis mediocribus, primo flavescens subscquamuloso-pruinulosis, serius fusco-cinereis subglabris subangulatisque; flores submarginales longe angusteque infundibuliformes extus viridi-glaucescens laxissime squamulosi, ovaris e terete subfuscoideo in tubo perianthico aequilongo producto, phyllis late obovatis acutiusculis, candidis, staminibus numerosis distichis, filamentis albis, antheris ochroleucis, stylo e virescenti albo superne laxe grosseque papilloso, lobulis stigmaticis 12 concoloribus coronato, stamina suprema superante. (Spegazzini 1925).

Varieties:

No record of any varieties of this plant have been found in the literature. In fact, many writers are of the opinion that G. brachypetalum itself should be relegated to varietal status under G. gibbosum.

This plant was first described by Spegazzini (1925) and although he gave it the status of a species he obviously was a little uncertain, stating in the notes supplementing his Latin diagnosis that it was "a species or variety intermediate between G. gibbosum and G. chubutense". The original author agrees that the flower of this species possesses a relatively long style raising the stigma lobes to a height equal to or exceeding that of the uppermost stamens, a feature shared by G. gibbosum and G. chubutense, but justifies the separation from these plants on the basis of the marked lengthening of the ovary and perianth tube "that together take on the appearance of a pedicel" and the relative shortness of the petals. Borg (1951) accepts this plant as a valid species, briefly summarising Spegazzini's description and adding nothing new. Backeberg (1959) mentions only the ovary tube as being elongated but otherwise is in agreement with Spegazzini, but whether this agreement is based on the study of actual plants or is just a repetition of the original description, is not clear. However, the title of his illustration (fig. 1689, p.1757) is followed by a question mark, and his phrase "fig.1689 must be this species" indicates considerable uncertainty and he then goes on to say that in the plant featured "the flower is shorter than is commonly found in G. gibbosum". This does not seem to indicate a flower whose ovary and flower-tube take on the appearance of a pedicel as Spegazzini describes. Nor does the occasional presence of a central spine on the plant illustrated check with either Spegazzini's or his own later (1965) statement that centrals are lacking. One is forced to the conclusion that Backeberg knew little or nothing of this plant as a living entity. Hosseus is reported by the same author as accepting this species as a valid one but apparently says little further about it.

Plants under this name appear to be rare in European collections but this may be due in part to their inclusion under G. gibbosum as a variety. In any case, G. gibbosum seems a most variable plant in itself and capable of producing large numbers of hybrids with other species under greenhouse conditions, so that plants from European sources are highly unreliable for study purposes, while in recent years at least, collectors do not appear to have been active in the more southerly regions of Argentina from where these plants are said to originate, and authentic material from habitat is rarely, if ever, available.

Description:

The following description is that of Spegazzini (1925).

The stem is almost cylindrical, erect, (8 - 10 cm long x 6 - 7 cm in diameter) of a dark glaucescent green, with 13 vertical ribs separated by well defined though not very deep, furrows. The ribs are acute, sinuous, and composed of more or less prominent tubercles, triangular-obovate (10 - 12 mm long x 15 mm wide) anteriorly sub-truncate to rounded, posteriorly ending in a tooth or acute hump. The areoles are elongated longitudinally (6 mm x 3 mm), somewhat sunken, and bearing short down of a pale ashy-grey colour. The spines number from 5 - 7 per areole, all more or less spreading radially (5 - 25 mm long), cylindrical tapering and slender, stiff, sharp, often somewhat curved upwards and outwards, never bulbous at the base. When young, the spines are yellowish, covered by an almost scaly pubescent layer, later becoming pale ashy-grey, practically naked, and almost angular. The flowers appear almost on the shoulder of the plant, growing long and narrowly funnel-shaped, upright (55 mm) glaucescent green on the outside, and bearing a dozen more or less semi-circular scales which are widely separated one from another and

are arranged in three spiral rows, gradually getting bigger from the base of the flower upwards. The ovary is almost cylindrical-fusiform (20 mm x 9 mm in diameter) extending upwards into a top-shaped perianth tube, (20 mm x 20 mm in diameter) violet coloured internally, terminating abruptly in a compact corona of perianth segments, close packed and imbricate, of which the inner ones are larger and wider (20 mm long x 12 mm wide), obovate, fairly acute and white in colour. The stamens are arranged in two groups, the lower separated from the upper by a narrow (4 mm) annular space, and all have white filaments and yellow linear anthers. The style (22 mm long) is cylindrical, slightly fusiform, greenish and smooth in the lower half, while the upper is white, its surface scattered with projections and small papillae. It ends in a stigma with 12 white lobes. The stigma and style equals or exceeds in height the anthers of the uppermost stamens.

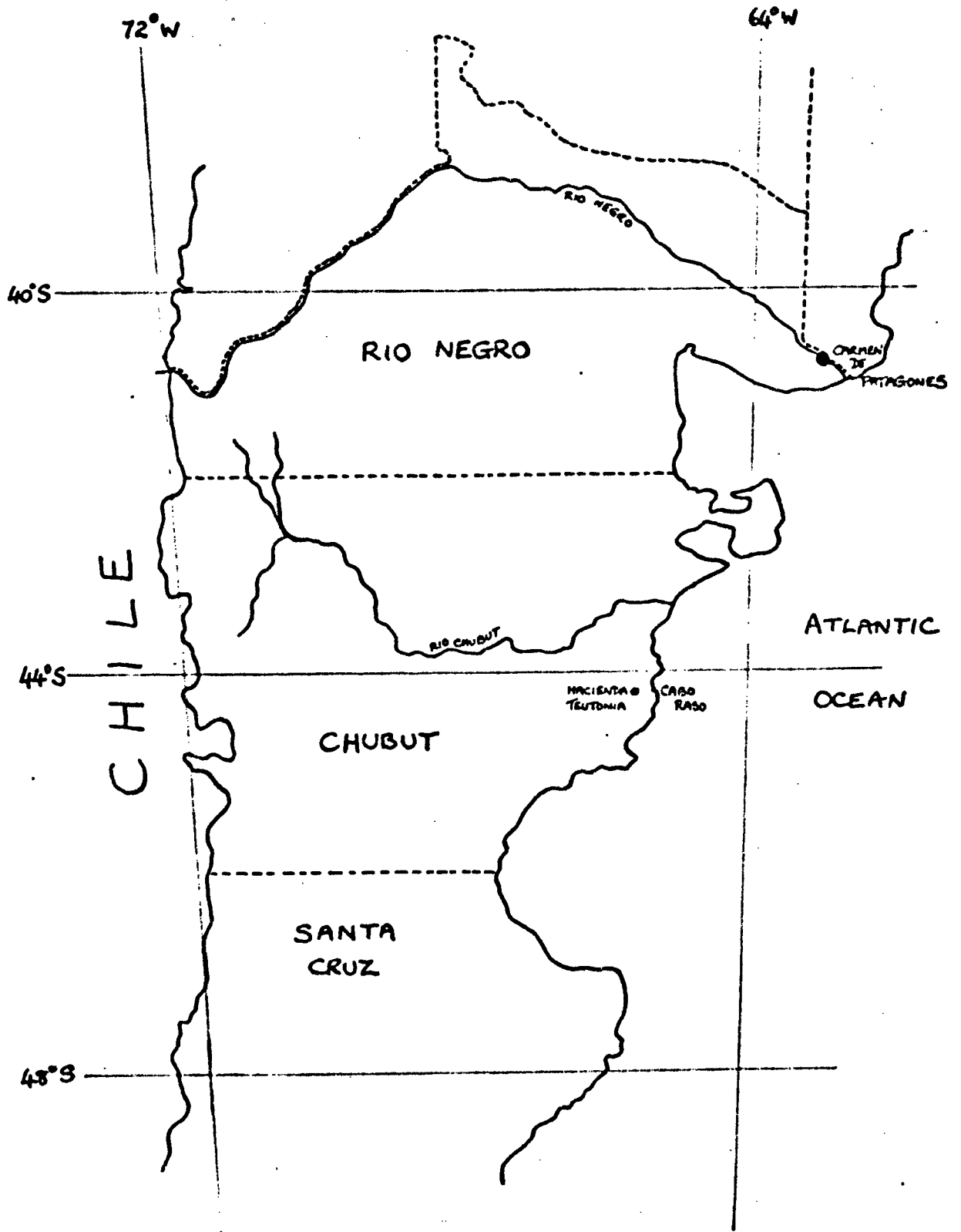
Habitat:

Spegazzini (1925) states that this plant occurs "on the low ridges and ravines of the Río Negro, in the vicinity of Carmen de Patagones". This town is in fact about 30 Km from the mouth of the river, from which the whole province takes its name. Immediately to the south is the province of Chubut and this too has been mentioned as a source of this plant but no documentary evidence is to hand at present. However, it should be noted that both these provinces are within the compass of the G. gibbosum complex of plants so that this second habitat is at least a possible one.

Map Reference:

CARMEN DE PATAGONES 62°59'W 40°47'S

Sheet: K20 - GOLFO SAN MATÍAS



Part of Southern Argentina

Distribution of *G. CHUBUTENSE* & *G. BRACHYPETALUM*.

(Scale: 1" = 105 miles)

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Group E

1. G. andreae
2. G. baldianum
3. G. uebelmannianum

These three plants have sufficient in common to justify a group to themselves, resembling each other more closely than they resemble other members of the genus. It would seem probable that G. uebelmannianum is the furthest removed, in terms of relationship, from the G. schroederianum group and G. andreae the closest. G. uebelmannianum is a relative newcomer to the genus (1972) and no doubt much more can yet be learned regarding the distribution of this species and the variation within it. G. baldianum has been known for a long time, but the limits of the species and its range of variation seem to be understood but poorly. G. andreae is well defined and offers few problems.

GYMNOCALYCIUM ANDREAE (Bödeker) Backeberg

Backeberg & Knuth: Kaktus ABC, p.285. 1935.

Synonymy: ECHINOCACTUS ANDREAE, Bödeker, Monatsschrift der Deutschen-Kakteen-Gesellschaft, Volume 2, pp.210 - 212. 1930.

Diagnosis:

Globosus, proliferans, vertice impressus, subglaber, paucis aculeis vix superatus; costae planae, ⁺ tuberculatae, sulcis distinctis separatae; areolae orbiculares, lana alba gerentes; aculei radiales 7, horizontaliter divaricati vel appressi, aciculares, exasperati, albi, basim versus subfusci; centrales 1 - 3, radialibus aemulantes, pulli; flores areolis juxta verticem sitio exorti; ovarium atque tubus cylindrica, viridula, squamis triangularibus ca. 6 praedita; petala linealoblonga, acutiuscula, integra, sulphurea; filamenta stylusque pallidiora; stylus stigmatibus 6 ochroleucis stamina superans. (Bödeker 1930).

Varieties:

1. var. GRANDIFLORA Krainz & Andreae. Die Kakteen, C 6e, p.1. 1957.

Diagnosis:

Robustius. Costae ad 11. Areolae longiusculae, ad 5 mm longae. Aculei radiales ad 2 cm longi. Aculei centrales (si adsunt) ad 2.5 cm longi. Pericarpellum subglobosum. Gemma globosa. Squamae et phylla perigonii exteriora prasina, haud striata. Flores ad 5.5 cm diametientes. Patria eadem velut speciei. (Krainz & Andreae 1957).

2. var. SVECIANUM Pazout. In Pazout, Valníček & Šubík, Kaktusy, p.132.1960.

Diagnosis:

Caula duriore, aculeis brevibus ad caulem inclinantibus, floribus minoribus, perigonii phyllis extus brunneis, intus candide

albis, tubo brevissimo a typo differt.

3. var. TULENSE (?) A possible variety but no details available.

NOTE:

GYMNOCALYCIUM ANDREAE Bodeker

GYMNOCALYCIUM ANDREAE (Bodeker) Werdermann

Both these combinations appear in Krainz (1957) but as Backeberg (1959) points out, they are incorrect, Werdermann not having recognised the genus in 1931, and Bodeker is not on record as having transferred this plant from Echinocactus to Gymnocalycium.

This species was first described by Bodeker (1930), the plant on which the description was based having come from the collection of Herr W. Andreae, of Bensheim, Hessen, who in turn had received it together with a number of other plants of the genus Gymnocalycium, all collected in Argentina by Professor Hosseus of Cordoba. It flowered in Europe in 1929 and the pure sulphur-yellow flowers together with its Argentinian origin, showed it to be a new discovery, for all yellow-flowered Gymnocalyciums had previously only come from Uruguay. The exact date of the collection is not quoted but Bodeker (1930) claims to have seen similar plants in a European collection as early as 1927.

Krainz's description of the plant (1957) is clearly based almost entirely on the original of Bodeker but acknowledges the unreliability of rib counts by stating "about 8 ribs" and describing the ribs themselves as "flattened" instead of "flattened-rounded". He also corrects the somewhat misleading "areoles ... bearing white wool" to "bearing white wool when young." The only other minor variation is in describing the central spines as "usually somewhat bent upwards" instead of "upwards and outwards".

He also remedies Bodeker's omission of the fruit and seed details. In the same publication, Krainz, together with Andreae, describes the variety, first collected by Professor Hosseus and sent to Europe in 1932, G. andreae var. grandiflorum.

Markus & Rausch (1968) have stated that in habitat, both large flowered and smaller-flowered plants occurred together so that the validity of this variety is obviously open to question.

Backeberg's description of the type (1959) differs little from the original except that the maximum size of the plant body is increased to 5 cm, and the radial spines are said to number sometimes only 5. The fruit is described as "slightly elongated". Only one variety is listed, variety grandiflorum, the description coinciding with that of Krainz. In a later publication, Backeberg (1965) includes a second variety, var. svecianum Pazout. Here again, one must be cautious in accepting the validity of the variety as Markus & Rausch (1967) reported that only some of the plants they collected had the typical sulphur-yellow flowers. It could well be that the wild populations of this species are variable in colour as well as flower size.

A third variety, var. tulense, is reputed to exist but details are lacking at present.

Seed of this species has been offered in Europe fairly recently under the number U38 by the commercial firm of Uhlig, probably habitat collected by Lembke in the 1961-1962 season but no habitat details are to hand. In 1965 Rausch & Markus collected material under the number R108 some of which found its way into European collections such as the

Linz Botanic Gardens, but authentic examples of the species are not particularly common. Numerous hybrids of greenhouse origin are to be found, particularly crosses with G. baldianum, having flower colours ranging from the original sulphur yellow, through orange almost to the red of G. baldianum, accompanied by corresponding intermediate body forms and colouration.

Crosses with G. bruchii are also reported (1963). It would be unwise however, to dismiss all colour variations within this species as merely greenhouse hybrids in view of Markus & Rausch's field observations on flower colour referred to above. It is unfortunate that no details were given of what the colour variations were.

Description:

The following description is based entirely on the original by Bødeker (1930):-

The plant body is spherical, usually somewhat flattened from above and a lustrous dark blue-green to blackish-green in colour, offsetting freely from the base and up to 4.5 cm in diameter. The growing point is somewhat depressed, tubercled, almost completely without wool, and covered by only a few spines. Ribs 8 in number, flattened-rounded, up to 1.5 cm broad at the base, separated by distinct furrows. They are broken up by sharp cross-furrows into somewhat flattened, rounded tubercles, which have a slight hump on the lower surface. The areoles are almost centrally placed on the tubercles, roundish, up to 2 mm in diameter, and particularly in the region of the growing point, bearing white wool. Radial spines 7 in number, arranged in three more or less horizontal pairs, and a single spine directed downwards. All are adpressed, slender, needle-shaped, often a little curved, up to 8 mm long,

rough, dull white with a brown base. Central spines 1 - 3, of similar strength and size or a little shorter, usually somewhat curved upwards or outwards, rough, and of a dark brown colour. The flowers are usually produced from younger areoles near the growing point and open to a flat funnel-shape measuring 3 cm long and 4.5 cm in diameter. The ovary is cylindrical 6 - 12 mm in size, leaf-green with about 6 spirally arranged triangular scales, with a distance of about 8 mm between them. They are up to 4 mm broad, grey-green and with a white border. The outer perianth segments range gradually from 5 - 25 mm in length and up to 6 mm wide, linear oblong and with short rounded points. They are entire, pale greenish yellow in colour with darker clear green, broad, midstripe on the abaxial surface. This stripe passes to olive or brownish olive near the top. The inner perianth segments are of similar shape, or, at the extremities, a little wider. They are short and sharply pointed, 5 mm x 25 mm in size and of a clear sulphur yellow. The filaments of the stamens and the style are a somewhat paler yellow, while the anthers and the six-lobed stigma, which together with the style just exceeds the stamens in length, are whitish yellow.

The fruit and the seeds were unknown to Bodeker at the time, but Krainz (1957) supplies the following details:-

The fruit contains about 30 seeds when ripe. Spherical, 12 mm in diameter with 4 - 7 scales and bearing the remains of the flower; bluish-green in colour. Seeds rounded, hat-shaped, about 1 mm in diameter, with a sunken, yellowish brown, somewhat elongated, hilum, and having a somewhat sunken micropylar opening opposite to the slightly swollen point of attachment. Testa dull black, delicately warted.

Gymnocalycium andreae var. grandiflorum was described by Krainz & Andreae (1957) as follows:-

A more robust plant than the type, with up to 11 ribs. The areoles are somewhat elongated, up to 5 mm long. Radial spines up to 2 cm in length, while the centrals, if any, are up to 2.5 cm long. The pericarpel is almost spherical. Buds spherical, as opposed to cylindrical in the type. Scales and outer perianth segments green but without central stripe. Flowers to 5.5 cm in diameter, opening in the morning while those of the type normally open during the afternoon.

The original description of G. andreae var. svecianum was published, apparently invalidly, by the Czech authors Pazout, Valniček and Šubík in their book "Kaktusy" (1960). The Latin diagnosis reads:- "Differing from the type in the rougher (?) body, with short spines bending down towards the plant body, the smaller flowers having perianth segments brown on the outside and pure white on the inside and an extremely short flower tube."

Habitat:

Habitat details are rather scanty but Bodeker's original description (1930) gave "Sierra de Cordoba, in the Pampa de la Esquina near the Cerro de los Gigantes, at 1500 - 2000 metres". The Sierra de Cordoba is the name applied to the high land of Cordoba stretching some 440 Km north to south between latitudes 29°S and 33°S and thus has no very precise meaning. However, Cerro Gigante appears on the map towards the northern end of the mountains and if this corresponds to the Cerro de los Gigantes, then this reduces the possible area considerably. Unfortunately, the Pampa de la Esquina does not appear on the map, but reference to the

contour lines shows that a considerable area of the eastern slopes of this northern end of the Sierra de Cordoba does lie between the heights mentioned by Bödeker, namely 1500 - 2000 metres. (This area is shaded in the sketch map.) It would thus seem fairly certain that the type locality lies somewhere in this area occupying the S.W. corner of the Department of Punilla. This is confirmed to some extent by Markus & Rausch finding G. andreae "in the Sierra Grande" region in 1965, this name being applied to the northern end of the Sierra de Cordoba.

Professor Hosseus is quoted (1957) as giving a further locality for the plant at "Cerro de Uritorco, Department of Punilla, 1800 metres." Although this Cerro is not marked on the map available, it seems highly likely that it is situated in the north-east corner of the Department and forms part of the Sierra Chica, which rises above 1500 metres but does not reach 2000 metres. This would account for Markus & Rausch searching (albeit unsuccessfully) in the region of Capilla del Monte during their 1965 expedition.

Donald (1974) reports that yellow-flowering plants resembling G. baldianum have been found amongst plants collected by Lau under his number, Lau 439 and distributed as "G. stuckerti". These were found at 1400 metres in the Sierra Medina, Tucuman, Argentina, and could well be G. andreae. If so, the distribution of this species must be considerably extended, but until such times as these plants become available for study, and positive identification, the present author prefers to leave the distribution map unaltered. There is a further possibility that such plants could belong under G. uebelmannianum (which see).

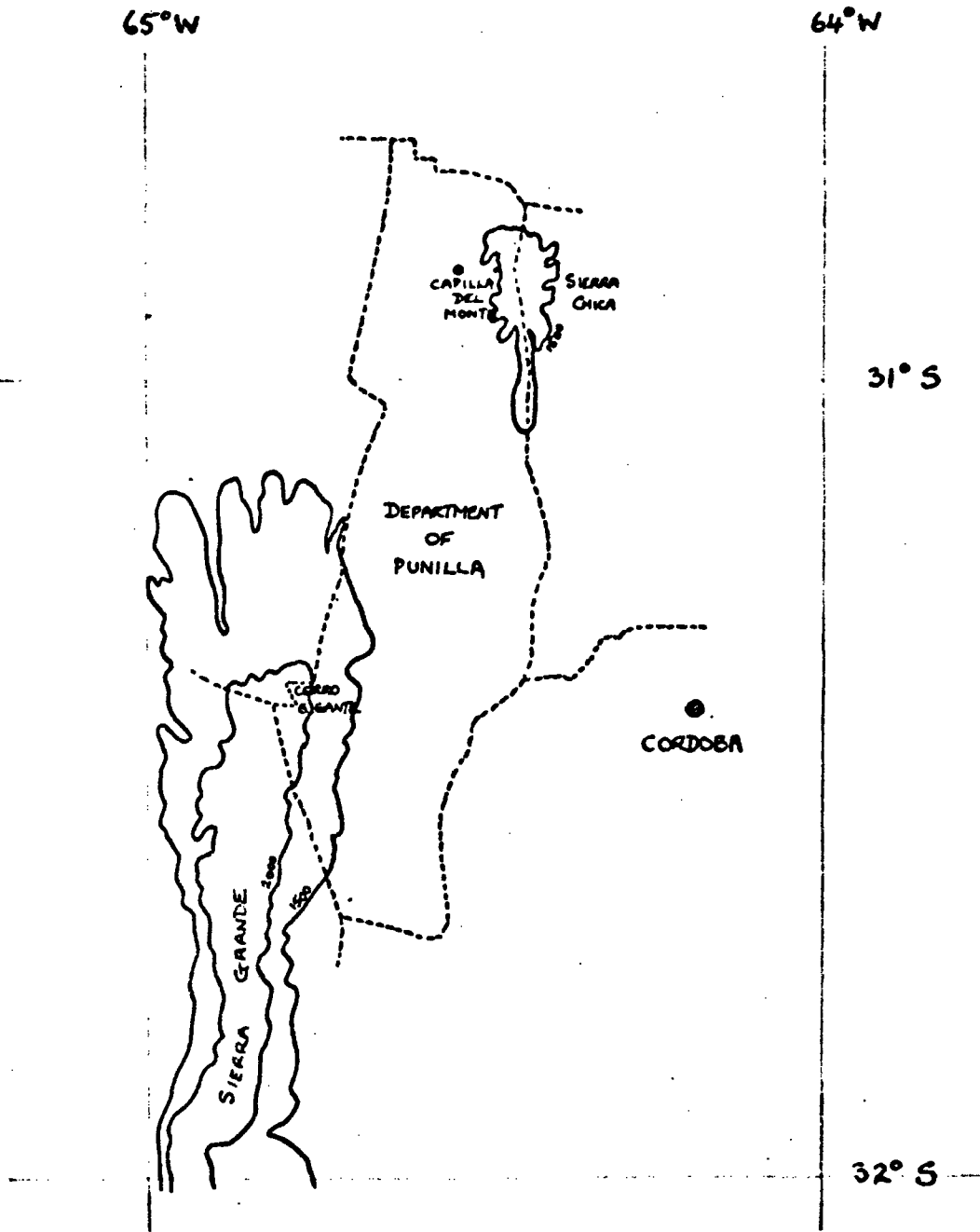
The picture which emerges, though somewhat sketchy, would seem to indicate a very limited and discontinuous distribution, the two areas being about 65 Km apart and separated by an area of lower land, most of

which, however, is still above 1000 metres. Only field studies can throw further light on this problem.

Map References:

CAPILLA DEL MONTE	64°32'W	30°52'S
CERRO GIGANTE	64°46'W	31°24'S
SIERRA CHICA	64°27'W	30°53'S
SIERRA GRANDE	64°50'W	31°33'S

Sheet: H20 - CORDOBA - SANTA FE



Part of the Province of Cordoba, N. Argentina.

Distribution of G. ANDREAE.

(Scale: 1" = 16 miles.)

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GYMNOCALYCIUM BALDIANUM (Speg.) Spegazzini

Spegazzini: Nuevas notas Cactológicas. In
Anales de la Sociedad Científica Argentina,
Volume 99, p.135. 1925.

Synonymy: Note - This is the synonymy at present accepted by most
authorities. It may, however, be necessary to
revise this in the light of further field investigations.

ECHINOCACTUS BALDIANUS Spegazzini: Cactacearum Platensium Tentamen.
In Anales del Museo Nacional de Buenos Aires.
Tomo 11, Series 3, part 14, p.505. 1905.

ECHINOCACTUS VENTURIANUS Frič nom. nud.

ECHINOCACTUS SANGUINIFLORUS Werdermann.

GYMNOCALYCIUM SANGUINIFLORUM (Werd.) Werdermann.

GYMNOCALYCIUM VENTURIANUM Frič ex Backeberg

GYMNOCALYCIUM VENTURII Frič nom. nud.

GYMNOCALYCIUM VENTURI Hort.

GYMNOCALYCIUM BALDIANUM Var. VENTURIANUM Frič ex Backeberg

Diagnosis:

Hybocactus, parvus globoso-depressus, obscure subeinerascente-viridis;
costis 9 - 11 latis et obtusissimis, sulco acuto profundiusculo limitatis,
fere in tuberculis solutis; areolis parvis; aculeis gracilibus saepius 5,
omnibus marginalibus radiantibus adpressis sordide pallideque cinereis;
floribus apicalibus erectis mediocribus extus obscure glauco-viridibus
glaberrimis laxe squamosis, squamis sensim in phylla intense purpurea
transeuntibus, laciniis stigmaticis brevibus 6 albo-ochroleucis.
(Spegazzini 1905).

Varieties:

GYMNOCALYCIUM BALDIANUM var. SANGUINIFLORUM nom. nud. (?)

GYMNOCALYCIUM BALDIANUM var. ALBIFLORUM nom. prov. *

Spegazzini was the first to describe this plant (1905) presumably having collected the original specimens himself. Some seventeen years later, Britton and Rose (1922) included this name as a synonym under Gymnocalycium platense but gave no reasons whatsoever, even publishing a photograph of Echinocactus baldianus supplied by Spegazzini himself, under the title of G. platense. The fact that G. baldianum flowers were described as "a beautiful deep red" seems to have been completely ignored. In a later publication (1925) wherein he transfers the plant to the genus Gymnocalycium Spegazzini very generously excuses their oversight in the light of "the enormous task they had undertaken" and goes on to point out that G. baldianum differs from G. platense by its possessing flowers only $\frac{2}{3}$ the size, with a smaller number of scales on the outside and by the reddish-purple petals which are only half the size of those of G. platense but especially by the stamens which are always most clearly divided into two groups. In addition, the violet coloured style with its six yellowish stigma lobes rises above the lower series of stamens but reaches only halfway up the filaments of the upper stamens. In contrast, the stamens of G. platense are described by the same author (1925) as being in a single group only and the stigma lobes of the style reach the level of the anthers of the uppermost stamens.

* Now described by Rausch as a full species - see G. uebelmannianum.

Both publications by Spegazzini (1905 & 1925) seem to have been overlooked in Europe however, as Werdermann (1932) later described G. sanguiniflorum from one double-headed plant collected by Dr. Hosseus in 1926 and sent to Europe under his number 179. Unfortunately no habitat details were given. It caused quite a sensation at the time as it was thought to be the first and only known red-flowered *Gymnocalycium*. Six years later, Dölz (1938) published an article pointing out the similarity between G. baldianum and G. sanguiniflorum. He compared the two authors' descriptions and came to the conclusion that it was a question of two examples of the same somewhat variable species and declared G. sanguiniflorum to be a synonym of G. baldianum. This has been widely accepted until the present day and it would indeed be difficult to refute it in the absence of detailed study of the red-flowering *Gymnocalyciums* in habitat. However, it should be borne in mind that Werdermann was working from a single plant whose origin was unknown. Dr. Hosseus sent it from Cordoba to Europe but did not apparently state categorically that it was collected near the town of Cordoba or even within the province of Cordoba, Argentina. It seems very strange in retrospect that Werdermann, describing a new species and having the collector's number for the specimen, did not bother to ask Dr. Hosseus what the habitat details were. Another puzzling feature is Werdermann's use of alternatives in his description, e.g. "Single or branching", "spherical or inverted-egg shape", "7 - 8 cm high" etc. etc. If he had only one specimen available, how was this information obtained?

Dölz's comparison of the descriptions is also suspect in so far as the flower details are not exactly as Spegazzini described them in his publications of 1905 and 1925. In the former, he used the Latin words

"INTENSE PURPUREA" and later in the same description "PULCHRE PURPUREIS". Stearn (1966) gives "Purpureus - purple, dull red with a slight dash of blue (Lindley)". In 1925 Spegazzini, writing in Spanish uses the word "PURPUREOS" which the dictionary gives as "purple". Dölz would have him say "PURPUR ODER ROSA_PURPUR" the dictionary rendering this as "purple or pink-purple", while Spegazzini is supposed to have described the filaments of the stamens as being pinkish red in colour whereas in actual fact neither in 1905 or 1925 does he mention the filaments at all. Strangely enough, Backeberg (1959) quoting Spegazzini, shows precisely the same two additions. A common source for the "quotation" could of course be Backeberg & Knuth (1935) but unfortunately the relevant text is in Danish and as no translation is available at present this cannot be checked. If this text is the source, then either it stems from a mis-translation of Spegazzini 1905 and/or 1925 or from a further publication by Spegazzini which so far has not come to hand. In any case, this could hardly be called "the original description". Because of this uncertainty, the comparison by Dölz has been remade from the originals of both Spegazzini and Werdermann. (See Table). There are indeed a number of differences but it must surely be merely a matter of opinion as to whether or not these may be overlooked due to the fact that one author was working from plants in habitat and the other from a single collected plant which had been in cultivation for a number of years prior to its being described. It is worthy of note that Hosseus, who collected Werdermann's plant was not himself happy about the synonymy of the two species (1939) but having stated the fact, does not appear to have written further on the matter.

Apart from the two anomalies in Backeberg's description (1959) mentioned above, one notices also that blue-green instead of grey-green has been added to Spegazzini's description presumably from Werdermann's description of

G. sanguiniflorum while the ribs are now said to be strongly tubercled instead of "for the most part broken up into tubercles". Rib number is given as 9 - 11 (Spegazzini's original numbers) while Werdermann's 10 - 12 is ignored. The plant is also said to be self-fertile, the resulting fruits being moderately large and longish, containing black seeds. The fact that this species is self-fertile is very much open to question, as in the experience of a number of European growers, this is not the case, and it would indeed be exceptional for the genus as a whole. In the Lexikon (1965) Backeberg records the plant as having a strong tap root and the spines are said to be 5 - 7 per areole, compared with Spegazzini 3 - 7 and Werdermann (G. sanguiniflorum) 7 - 9. Spine colour is said to be pinkish-grey to horn-grey or ashy-grey, at first somewhat darker at the base, and more or less appressed. Spegazzini gave ashy-grey, while Werdermann (G. sanguiniflorum) white or pale brown, occasionally reddish ... usually with darker tips, brown ... at the base.

A further complication arises from the fact that according to Backeberg (1959) Frič collected a red-flowered Gymnocalycium in 1929 and brought it back to Europe, naming it G. venturii but not providing a description. Various names occur in the literature such as Echinocactus venturianus, Gymnocalycium venturi, G. baldianum var. venturianum and G. venturianum, all presumably referring to plants of the Frič type. Dölz (1938) reduces all these to synonyms of G. baldianum. Backeberg (1959) supporting the concept of one rather variable species put forward by Dölz says that Spegazzini himself stated in the original description that the tubercle shape was somewhat variable and the petal colour varied from pale to dark red. Once again, no such statement is traceable either in Spegazzini (1905) or (1925).

A comparison of G. baldianum (Speg.) Speg.
and G. sanguiniflorum (Werd.) Werd.

Feature	<u>G. baldianum</u>	<u>G. sanguiniflorum</u>
Body	Simple, small, depressed-globose, 4 - 7 cm \emptyset , 2.5 - 4.0 cm high, dark almost grey-green, growing point slightly umbilicate, not woolly.	Simple or branching at the base, spherical or slightly inverted egg-shaped 7 - 8 cm high and the same in diameter. Growing point depressed, lacking spines. Body colour dull, particularly dark green at the growing point, later somewhat paler and going somewhat blue-grey.
Ribs	9 - 11, wide and very blunt, bounded by moderately deep furrows. Ribs straight 5 - 8 mm high, 10 - 15 mm wide at the base. For the most part, broken up into tubercles.	10 - 12, at first narrow and about 1 cm high, soon becoming markedly broader and almost completely flattened, markedly tuberculate even in region of growing point, but never-the-less continuous.
Tubercles	4 - 6 per rib, confluent at the top, clearly separated at the base, with unequal sides and with the lower margin often more or less in the form of a hump.	More or less 4 - 6 sided with somewhat protruding chin under the areole.
Areoles	Small, strongly sunken, slightly elliptical, 3.0 cm long, 1.5 mm wide, 5 - 7 mm apart.	Sunken, elliptical. Wool in young areoles, but never becoming completely bare of wool, 3.5 mm long 2.5 mm broad.
Radial Spines	Slender, 3 - 7, usually 5, spreading appressed, dingy pale grey, straight or somewhat curved 7 - 12 mm long.	7 - 9, spreading or somewhat out-standing, straight or somewhat curved, strong needle-like or slender awl-shaped, piercing, to 1.5 cm long, white or pale brown, occasionally reddish, thickened at the base, in pairs one single one directed downwards, rough scaly, usually with darker tip, brown and somewhat thickened at the base.

Feature	<u>G. baldianum</u>	<u>G. sanguiniflorum</u>
Central Spines	None, always completely absent.	None.
Flower	Arising from the shoulder near the apex solitary or 2 - 3 together, moderate size, 35 - 40 mm in height. Dark glaucous green externally, glabrous openly arranged scales, passing over into deep reddish petals.	About 4.5 cm long, blood red, arising near the growing point. Ovary moderately slender, with moderately closely arranged broadly heart-shaped scales of about 3.5 mm ϕ . Scales scarcely noticeably darker at the tips and pale bordered. Flower tube short, broadly bell-shaped. Flowering August - September in Europe.
Stamens	In two groups, anthers whitish to pale yellow.	In two groups, one around the style, the other becoming free at the end of the flower tube. Filaments red, becoming paler above, anthers pale yellow.
Stigma & Style	Stigma lobes 6, short, white to pale yellow, style violet coloured, reaching halfway up the filaments of the upper stamens.	Style red, stigma lobes about 11, whitish about 2 mm long, spreading a little, shorter than the longest stamens.
Habitat	Rather rare, or very rare in the mountains near Ancasti, Province of Catamarca.	Argentina, ex Hosseus No.179. 1926.

Vatter (1952) writes of finding G. venturi in habitat on the Tucuman-Catamarca border. He states that it only grows in this locality and is the only Gymnocalycium in the area. He comments on the variability of the spines and general form but does not go into detail. Neither does he mention variations in flower colour but his habitat photograph shows plants very similar to that in Spegazzini's original photograph of G. baldianum.

According to Backeberg, Y. Ito (1957) retained both G. baldianum and G. venturianum in his revision of the genus but surprisingly also made a new combination G. platense var. baldianum from the erroneous synonym of Britton & Rose, G. platense (Speg) Br. & R. = E. baldianus Speg.

Till (1972a) takes the argument full circle by accepting just one species, G. baldianum, but insisting on the separation of various distinct forms. Like previous authors, he prefaces his remarks with a "quotation" of Spegazzini's original description. Now we see the plant body described as blue-green (a feature added by Backeberg from Werdermann), ribs 8 - 11 (originally 9 - 11) spines usually 5 often more (7), an alteration by Till, flowers blood-red to violet-purple (deep red or purple in the original), with a metallic sheen (added by Till), filaments of stamens pinky-purple (an addition by Backeberg).

In mentioning the plant named G. sanguiniflorum by Werdermann, Till states that it was found in Cordoba, contrary to Werdermann's own statement that the habitat was unknown. Till then refers to some plants which were sent by Frau Muhr (who lives in Northern Argentina) to the Botanic Gardens at Linz in July 1969 under her number B80. No habitat details are given. He claims that they were "similar plants to Werdermann's G. sanguiniflorum, though he does not justify this in any way. When they flowered, they showed a "market divergence" from the type. Bayr (1970), then at the Linz Botanic

Gardens, called the B80 plants G. baldianum but agreed that they were atypical.

Similarly, Frič's plant G. venturii Till would regard as being distinct again from the type, being larger, with robust tubercles, flowers twice the size of the type, bell-shaped and widely opening. All the plants known to him are remarkably uniform, and so this, too, he would separate as a distinct form.

In discussing the species proper as he understands it, Till repeats the erroneous statement that Spegazzini in his original description said that G. baldianum varied in flower colour and then mentions G. baldianum var. sanguiniflorum (no author or details given) having pink(!) flowers. His illustration (wrongly numbered) shows a plant appearing to be a typical example of a European greenhouse hybrid between G. baldianum and possibly a member of the Trichomosemineae sub-group. In fairness, however, it must be noted that at least in part of the habitat area, G. baldianum grows together with G. asterium (Trichomosemineae) although Markus & Rausch (1968a) expressed the opinion that the plants flowered at different times and thus did not hybridise. In European greenhouses, the flowering seasons do in fact overlap, if not actually coinciding, but of course, conditions here are far from natural. He also mentions white forms of G. baldianum. All these flower colours were said to be represented amongst a batch of collected plants sent to Europe by Fehser in 1962, and at least all those obtained by Till resembled Spegazzini's original plant.

In conclusion, he mentions a Gymnocalycium collected by Rausch in the Sierra de Velasco, under number R141, which was provisionally named G. baldianum var. albiflorum. This has now been named G. uebelmannianum Rausch, thus justifying Till's opinion that it warranted more than just varietal status.

Markus & Rausch themselves (1968a) stressed the variation found in habitat plants of G. baldianum. Flower colours varied from blood red, through paler shades to pink edged and finally to completely white petals. Petals were sometimes lanceolate and widely separated, sometimes broad and rounded.

From the foregoing discussion of the literature, the only clear fact emerging is perhaps that the position regarding G. baldianum is extremely confused! However, from correspondence with collectors in Britain and my own experience over the last few years, it certainly seems as if there is considerable support for Till's idea of there being several well-defined forms which all produce flowers of some shade of red (and possibly white), but whether these should be regarded as closely related species, or forms of one species cannot be decided here. Only carefully documented field investigations can shed any light on this problem, greenhouse material from Europe being highly unreliable due to the many hybrid forms which, either accidentally or deliberately, have been produced and marketed in large numbers by commercial growers. All flower profusely in delightful shades of colour from deep purplish-red through pink to white and even orange coloured flowers are possible when a red flowered plant is crossed with G. andreae (yellow), such plants obviously being in great demand by the general public. Another plant frequently met with commercially is the cross between G. baldianum and G. denudatum known under the cultivar name of Jan Suba. Although the features of the plant body are predominantly those of G. denudatum, the flower colour is usually a bright pink. It is only too easy, having seen so many such plants and so few plants collected in habitat, to assume that the former are typical of the species and one suspects that some at least of the more recent authors have done just this. The present author is of the opinion that Werdermann's plant may have been

wrongly placed in synonymy with G. baldianum and may in fact be better placed with G. oenanthemum and G. tillianum, two other red-flowered *Gymnocalycium*s which lie, however, outside the group at present under review. Backeberg and others seem to have based their descriptions on a mixture of Spegazzini's G. baldianum and Werdermann's G. sanguiniflorum and thus made the confusion even worse by producing what may be referred to as an "armchair hybrid". Whatever the truth of this may be, for the moment it seems reasonable to retain only Spegazzini's description for the species and await further field details before attempting to resolve the remainder of the problem.

Description of G. baldianum (Speg.) Speg. based entirely on Spegazzini (1905) and (1925)

Plant body simple, small, depressed globose, 4 - 7 cm in diameter, 2.5 - 4.0 cm in height, dark almost grey-green in colour. Growing point slightly umbilicate lacking any wool. Ribs 9 - 11, wide and very blunt, bounded by moderately deep furrows. Ribs straight 5 - 8 mm high, 10 - 15 mm wide at the base, for the most part broken up into tubercles, approximately 4 - 6 per rib, confluent at the top, clearly separated at the base, with unequal sides and with the lower margin often more or less in the form of a hump. The areoles are small and markedly sunken, slightly elliptical, 3.0 mm long by 1.5 mm wide, 5 - 7 mm apart. The radial spines are slender, 3 - 7, usually 5, spreading, appressed, dingy pale grey, straight or somewhat curved, 7 - 12 mm long. There are no centrals present. The flowers arise from the shoulder of the plant near the growing point, solitary or 2 - 3 together, of moderate size, 35 - 40 mm in height. Dark glaucous green externally, with glabrous, openly arranged scales,

passing over into deep reddish petals. The stamens are in two groups, having whitish to pale yellow anthers. The style is violet coloured, terminating in six, short, white to pale yellow stigma lobes, level with a point halfway up the filaments of the upper stamens. Rather rare or very rare in the mountains near Ancasti, Province of Catamarca, Argentina.

Habitat:

When first describing this plant, Spegazzini (1905) stated that it was very rare in the mountains near Ancasti, Province of Catamarca. In his second publication (1925) he substituted "rather rare" but gave the same locality. Backeberg (1959) quotes Spegazzini's location and then in the Lexikon (1965) merely says "Catamarca". Markus & Rausch in 1965 (1968) and (1970) confirmed the presence of the plant in this area among those reaching Europe. Unfortunately some confusion exists here too, as a list of all Markus & Rausch collection numbers (1972b) does not mention G. baldianum from the Sierra de Ancasti, in 1965 or any other expedition of theirs, while R150 G. baldianum appears as having been collected in the Andalgalá - Hualfin area of Catamarca, a region considerably further north and west from the area covered by the sketch map. This problem cannot be resolved further at present. The same two collectors also in 1965 discovered a white flowering G. baldianum near Los Colorados in La Rioja province. It was growing at a height of over 2300 metres in the Sierra de Velasco. It was placed under their collection number R141 and provisionally named G. baldianum var. albiflorum, now named G. uebelmannianum Rausch. It was this plant that Till (1972a) considered to be a new species. The literature cited makes no reference to any red-flowered G. baldianum growing in the Sierra de Velasco.

Lau, during his collecting trip in Argentina 1970/72 (1972b) once again collected G. baldianum near Ancasti at a height of 1000 metres and it was imported into Europe as Lau 501.

Unfortunately no habitat details were given for Werdermann's G. sanguiniflorum, and up to the present no such details for Frau Muhr's B80 are available either.

In the book by Borg (1951) G. baldianum does not appear, but G. venturianum is featured. The general details appear to be correct but the author concludes by describing the species as resembling a Rebutia and gives its habitat as Uruguay, near Montevideo! This surely can be dismissed as a matter of pure error and need not confuse the issue further.

Vatter (1952) describes how, on an unspecified occasion, he collected a red-flowered Gymnocalycium, which he called G. venturi Frič, on the watershed between Tucuman and Catamarca. This rather vague area may be localised, however, as he was travelling by bus on the road from the town of Tucuman to that of Catamarca. Reference to the sketch-map shows that after La Cocha, the road runs southwards and climbs up to and over the 1000 metre contour for about 5 Km before dropping down again below this level at La Merced, and subsequently going on to Catamarca. Presumably it was in this region that the plant was found. Vatter's habitat photograph shows a plant very similar to that in Spegazzini's photograph of G. baldianum. G. venturi is said by Šubík (1968) to come from the mountains near Catamarca, while Till (1972) says merely "mountains of Catamarca".

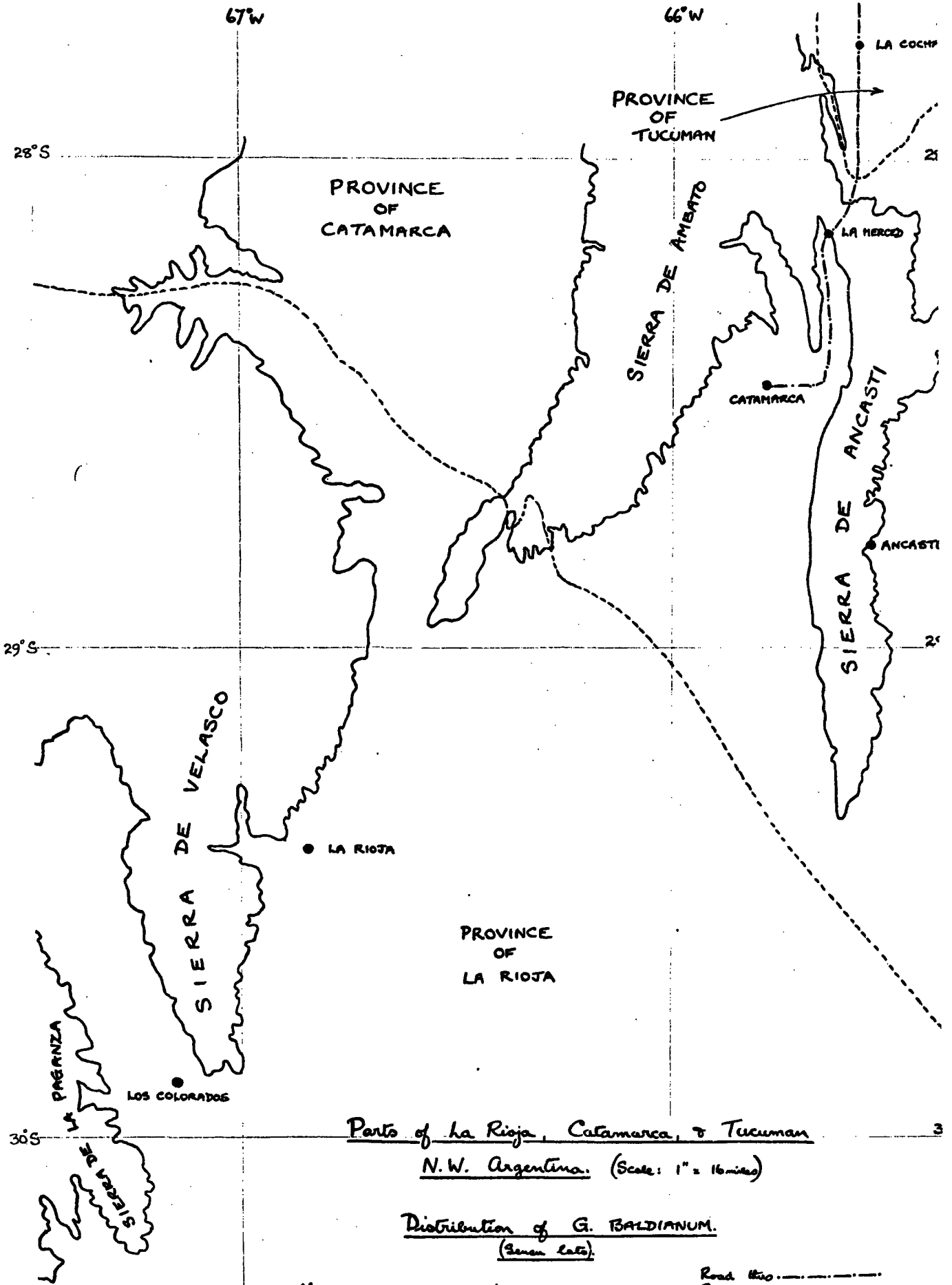
G. baldianum was collected by Ritter during his expeditions some years ago and was placed under FR443 but no further information is available at present.

It now seems certain that some, at least, of the plants collected by Lau in the Sierra Medina at 1400 metres during his expedition 1970/72 under Lau 439 were in fact G. baldianum (see also under G. stuckertii). The plants produced flowers varying in colour from white through pink to shades of deep red.

Map References:

LA COCHA	65°35'W	27°47'S	)	Sheet G20
SIERRA MEDINA	65°09'W	26°24'S	)	TUCUMAN
LA MERCED	65°38'W	28°10'S)	
CATAMARCA	65°47'W	28°28'S	)	Sheet H20
ANCASTI	65°32'W	28°48'S	)	CORDOBA - SANTA FE
SIERRA DE ANCASTI	65°39'W	28°39'S)	
SIERRA DE AMBATO	66°04'W	28°23'S)	
SIERRA DE VELASCO	67°09'W	29°16'S	)	Sheet H19
LA RIOJA	66°52'W	29°25'S	)	COQUIMBO - SAN JUAN
LOS COLORADOS	67°09'W	29°53'S)	

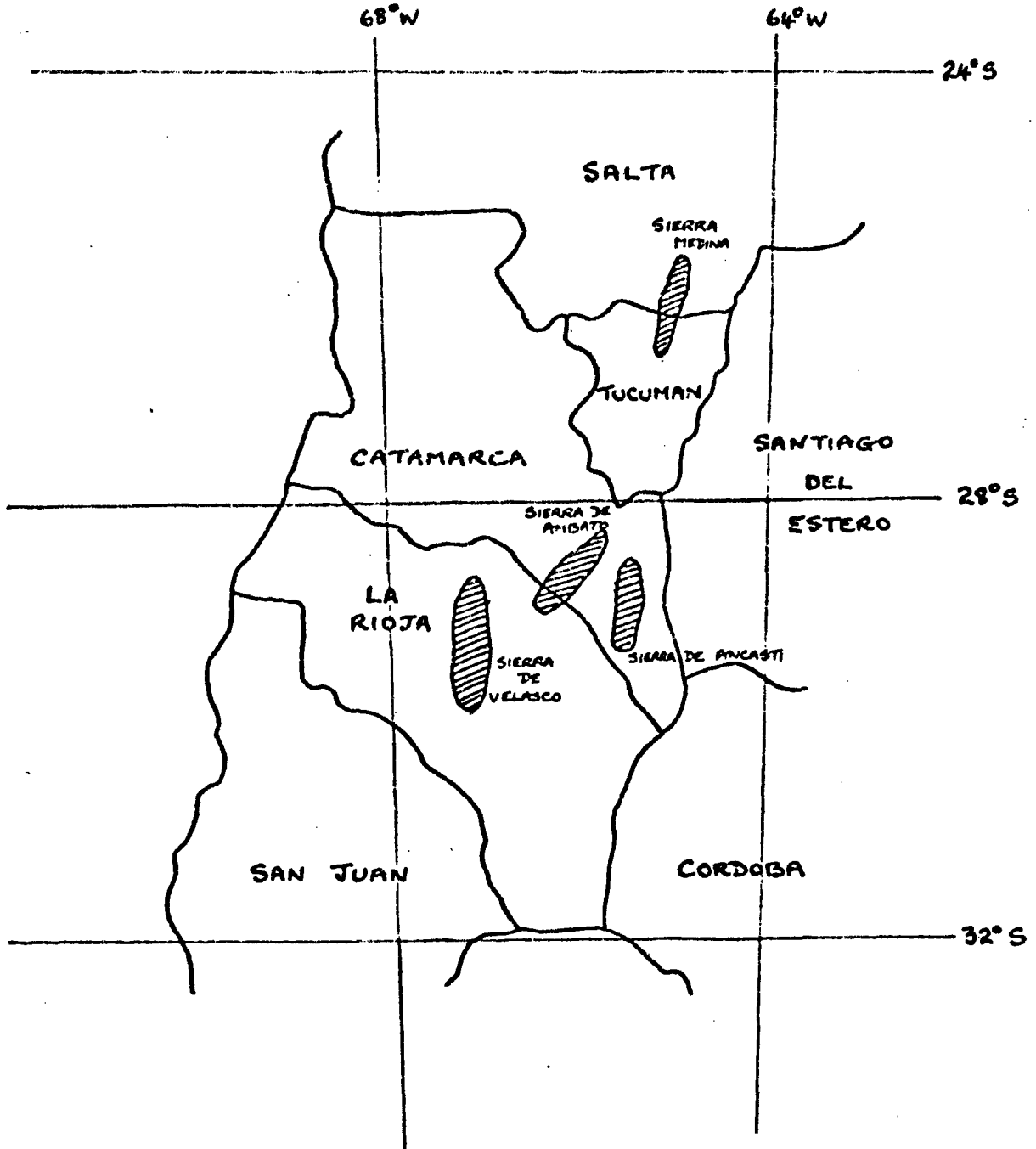
Note: The plant G. tillianum referred to in the final paragraph of the general discussion above as being possibly closer to Werdermann's G. sanguiniflorum than is G. baldianum, also comes from the same habitat area and has been collected by Markus & Rausch in 1968 as R227 and Lau in 1970/72 as Lau 488, in both instances from the Sierra de Ambato, in the latter case, at a height of 2300 metres.



Parts of La Rioja, Catamarca, & Tucuman
N.W. Argentina. (Scale: 1" = 16 miles)

Distribution of *G. baldianum*.
(Genus late).

N.B. Mountains outlined using 1000 meter contours. Road lines. Provincial boundaries dotted.



Small scale map of N.W. Argentina showing
possible range of *G. BALDIANUM* (sensu lato).

(Scale = 1" = 105 miles)

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GYMNOCALYCIUM UEBELMANNIANUM Rausch

Rausch: Succulenta Volume 51, No.4, April 1972. pp.62-64.

Synonymy:

GYMNOCALYCIUM BALDIANUM var. ALBIFLORUM Rausch, nomen nudum.

Diagnosis:

Simplex, laesum saepe proliferans, plane-globosum, 10 mm altum et ad 70 mm diametens, glaucum, profunde in solo occultum, radice napiformi; costis 8 - 12, rectis, sulcis transversis in gibberes ca. 5 - 8 mm longos divisis; aculeis marginalibus 5 - 7, plerumque uno deorsum directo, 5 - 15 mm longis, mollibus et paulum arcuatis, cretaceis, aculeo centrali 0. Floribus 35 mm longis et diametentibus; ovario conico, receptaculo infundibuliformi, viridi - nitido squamis cordiformibus, subfuscis et roseo - acuminatis tecto; phyllis perigonii exterioribus in superiore parte batilli modo dilatatis et indistincte acuminatis, olivaceis ad subfuscis clarius marginatis; phyllis perigonii interioribus angustioribus, non dilatatis, cuspidatis, albis intus flavis; fauce clare - (vel obscure -) rosea, filamentis albis basi roseis, imis paulum incrassatis et laxè circum stylum dispositis, e toto receptaculo orientibus; antheris latis, flavis, stylo crasse - cylindrato, flavido, imo viridulo, stigmatibus 10, 4 mm longis, flavidis. Fructu late-globoso, 6 mm diametente, viridi squamis ochraceis tecto. Seminibus ollaeformibus, 1 mm diametentibus, opace - nigris, hilo basali. (Rausch 1972).

Note: There are at present no named varieties or forms, although quite striking long-spined and very short-spined forms are illustrated.

This species was collected by Markus & Rausch during their expedition of 1965 and provisionally named G. baldianum variety albiflorum but without a description. The original collection number was Rausch 141. (See under G. baldianum). More recently, Rausch (1972) has published a description of it as a species in its own right. The account which follows is a translation of the Latin diagnosis. Unfortunately no English translation of the Dutch portion of the article is as yet available, but it would appear only to repeat the details of the diagnosis with the exception of the last paragraph where it would seem that the author refers to G. andreae and G. baldianum as being somewhat similar and possibly related. The plant has not so far been offered commercially in any quantity, if at all, but a small seedling, privately obtained by the present author for his reference collection, does show some similarity to the two species mentioned. However, it is still immature and has yet to flower so that further comparison must be left until a later date.

Description:

Plant body simple, often proliferating after damage, flattened spherical, 10 mm tall and up to 70 mm in diameter, having a fine waxy bloom like a cabbage leaf. The plant is deeply sunken in the soil and has a carrot-like root. Ribs 8 - 12, vertical, divided by transverse grooves into humps about 5 - 8 mm long. Radial spines 5 - 7, frequently with one of them directed downwards, 5 - 15 mm long, slightly curved, pliant and chalk-white in colour. Central spines absent. Flowers 35 mm tall and the same in diameter. The ovary is conical, the receptacle funnel-shaped, covered with shiny green heart-shaped scales which have slightly blackish-brown and pink tips. The outer perianth segments are

expanded in their upper parts into a shallow dish-like form and have an ill-defined point. The inner perianth segments are not expanded, are narrower, reducing abruptly to a point. They are whitish on the outside, pale yellow on the inner surface. The throat of the flower is bright or dull pink, and the filaments of the stamens are pink at the base. The lowest of them are a little thickened, and loosely arranged around the style. The whole of the receptacle bears stamens. The anthers are broad and yellow in colour. The style is robustly cylindrical, pale yellow, but greenish at the base. It has 10 stigma lobes, 4 mm in length, yellowish in colour. Fruit broadly globose, 6 mm in diameter, green, covered with yellowish-brown scales. Seeds pot-shaped, 1 mm in diameter, dull black, with basal hilum.

Habitat:

The only habitat details given are "Argentina, Sierra de Velasco, at a height of 2200 - 2800 metres".

Donald (1974) reports that yellow-flowered plants have been found amongst material imported under the number Lau 439, and which originated at 1400 metres in the Sierra Medina, Tucuman, Argentina. There is perhaps a slight possibility that these plants might be G. uebelmannianum but the present author has yet to see such plants and until that time, it must remain just a suggestion.

(For map reference and map of the locality, see under G. baldianum).

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Group F

1. G. leptanthum
2. G. sigelianum
3. G. sutterianum
4. G. capillaense

This group consists of three closely related species, regarded with some justification by others as a single "complex", and a linking species, G. leptanthum which is much nearer G. schroederianum. All four species are not as well known as one would wish, and fresh information from habitat could well necessitate a radical reassessment of the position.

GYMNOCALYCIUM LEPTANTHUM (Speg.) Spegazzini

Spegazzini: Nuevas notas Cactológicas, In Anales de la Sociedad Científica, Argentina. p.138. 1925.

Synonymy:

ECHINOCACTUS PLATENSIS var. LEPTANTHUS Spegazzini, Cactacearum Platensium Tentamen. In Anales del Museo Nacional de Buenos Aires, Volume 11, Series 3, part 14, p.504. 1905.

GYMNOCALYCIUM PLATENSE var. LEPTANTHUM (Speg.) Y. Ito. In Explanatory Diagrams of the Austroechinocactanae. p.194. 1957.

GYMNOCALYCIUM LEPTANTHUM (Speg.) Y. Ito. Ibid. p.197.

Diagnosis:

Cormi magnitudo, color et costae ut in praecedente; (i.e. in variety quehliana:- Cormus depresso - globosus, 3 - 5 cm alt. et diam, e glauco viridis; costae 8 - 11 valide tuberculatae.) aculei saepius 7 validiusculi (7 - 10 mm long.) arcte adpressi recti v. recurvi; flores erecti elongati graciles (60 - 65 mm long.), tubo perigoniali phyllis albis triente longiore. (Spegazzini 1905).

This plant was first described as a variety of E. platensis by Spegazzini (1905) but very little detail and no illustration was provided. Later (1925) he added some further details and raised it to the status of a species. A photograph was also published, together with a reference to a second photograph of his, previously published by Britton & Rose (1922). Unfortunately, the two illustrations differ considerably and serve to confuse the issue rather than clarify it. The uncertainty and confusion which surround the identification of this plant and also G. platense in Europe today is largely due to Spegazzini himself who gave very inadequate descriptions and who in the first instance (1896) based the original

description of G. platense (then E. platensis) on a mixture of at least two quite different plants from different seed groups and from widely separated geographical areas. In 1925 he writes: "After a lengthy study of my notes and analytical drawings of the flowers of this species (G. leptanthum) I am convinced that ..." There is no mention of any reference to growing plants, habitat studies or herbarium specimens, merely to notes and drawings which could well have been those of 1905 or even the original ones from 1896 based on a very confused concept of E. platensis and its varieties, and well over twenty years old.

As a result of this very unsatisfactory background, the species is included here only for the sake of completeness, and the description, such as it is, is derived solely from Spegazzini's own works (1905 and 1925). Careful study of the reputed habitat of both G. platense and this species is needed in order to resolve the problem. Unfortunately, it may well be too late for even in 1939, Hosseus wrote "Already, today, the species is rare in its native habitat".

Although both Spegazzini (1925) and Hosseus (1939) give Cordoba province as the only source of the plant, the only record to hand of habitat material collected in recent years gives the origin as Catamarca. Rausch (1972) during his collecting trip of 1968 is recorded as having found this species in the Sierra Ambato and to have brought it back to Europe under the collector's number R225. Unfortunately neither specimens nor illustrations of them have been seen by the present author, so that the reliability of the identification cannot be assessed.

Description:

Body flattened, spherical (3 - 5 cm high and in diameter), of a glaucous green, ribs 8 - 11, robust and tuberculate. Spines often 7

(7 - 10 mm in length) closely appressed, straight or recurved. Flowers erect, elongated, slender (6.0 - 6.5 cm long) flower tube three times longer than the petals, which are white in colour. Stamens clearly distichous (in two series) and the white style, topped by six stigma lobes of a similar colour, only reaches the middle of the filaments of the upper stamens.

Habitat:

Spegazzini (1925) states that the plant is found in "the dry and stony hills in the vicinity of Cosquín, province of Cordoba". Hosseus (1939) confirms Cordoba as the region but is not specific as to where it occurs within the region. Rausch (1972) reports the plant from the Sierra de Ambato, province of Catamarca.

Map References:

COSQUÍN	64°28'W	31°14'S
SIERRA DE AMBATO	66°04'W	28°33'S

Sheets: H19 - COQUIMBO - SAN JUAN
H20 - CORDOBA - SANTA FE

For sketch maps, see under G. capillaense (COSQUÍN) and G. baldianum (SIERRA DE AMBATO).

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GYMNOCALYCIUM CAPILLAENSE (Schick) Backeberg

Backeberg & Knuth; "Kaktus ABC", p.287. 1935

Synonymy:

ECHINOCACTUS CAPILLENSIS Schick, Möller's Deutsche Gärtner-Zeitung.
Volume 38, No.26, p.201. September 1923.

Diagnosis:

Körper neidergedrückt kugelig, hechtgrün, am Scheitel mässig eingesenkt, warzig, fast unbewehrt, mit schwacher Wolle. $3\frac{1}{2}$ cm hoch und 6 cm breit. Rippen 9, Areolen 4 mm Durchmesser, 2 cm voneinander entfernt. Stacheln nur randständig 5, 15 mm lang, hellhornfarbig stielrund, gerade, stechend.

Blüten aus den oberen bestachelten Areolen. Länge derselben vor dem Aufblühen 8 cm, ganz geöffnet 6 cm breit, aussen ganz kahl mit halbkreisförmigen grünlich weissen Schuppen besetzt. Blütenhüllblätter ziemlich fleischig, und spatelig, elfenbeinfarbig mit grünem Rückenstreifen innere lanzettlich, elfenbeinweiss mit hellrosa Mittelstreifen mit weinrotem Schlund. Staubgefässe und Beutel gelb. Stempel mit 10 Narben gelblich weiss. Beere spindelförmig, 4 cm lang, $1\frac{1}{2}$ cm breit, bläulichgrün, mit weissen Schuppen besetzt. (Schick 1923).

First described by Schick (1923) from amongst plants collected in Northern Argentina in June 1922, this species was not given a particularly detailed description, nor was it illustrated at that time. Berger (1929) does not appear to recognise this plant although including in his account of the genus Gymnocalycium the closely associated G. sutterianum and G. sigelianum. These had both been described (as Echinocacti) by Schick at the same time

as E. capillensis. Some years later, it was Backeberg & Knuth (1935) who acknowledged its existence by transferring it from Echinocactus to the genus Gymnocalycium. Backeberg (1959) lists the plant and his description differs little from that of Schick in any important feature. The size of the plant becomes 8 cm in diameter and 8 cm high, (in the Lexikon of the same author (1965) it becomes 9 cm in diameter and 9 cm high), while the rib number becomes "up to 13" and areoles only 1 cm apart instead of 2 cm according to Schick. The spines become "yellowish white 1.2 cm long" in Backeberg but pale horn-coloured and 1.5 cm long in the original. The flower tube is also recorded as being shorter - 7 cm instead of 8 cm. The only major difference in the descriptions is the statement by Backeberg that the plant typically forms a clump by off-setting quite early in life, a fact not mentioned by Schick at all.

Imported material under this name is available from time to time and Rausch collected seed in the Sierra Chica in 1965 under Rausch No.106. Other seed, reputedly collected at Cosquín, Sierra de Cordoba was also available in Europe a few years ago.

Description: (Based on the German text, there being no Latin diagnosis).

Body depressed spherical, pike green (?), apex markedly sunken, warty and almost completely devoid of spines and with scanty wool. 3.5 cm high and 6 cm in diameter. Ribs 9. Areoles 4 mm diameter, 2 cm apart. Spines only radial, 5, 15 mm long, pale horn coloured, cylindrical, straight, piercing. Flowers arising from the upper spined areoles, overall length before opening 8 cm, 6 cm in diameter when fully open. Completely naked on the outside, and bearing semicircular greenish-white scales. Perianth segments moderately fleshy and spatulate, ivory

coloured with green stripe on the back, the inner ones lanceolate, ivory white with pale pink mid-stripe, and wine-red in the throat. Stamens and anthers yellow. Pistil with 10 lobes, yellowish white. Berry spindle-shaped, 4 cm long and 1.5 cm in diameter, bluish green with white scales.

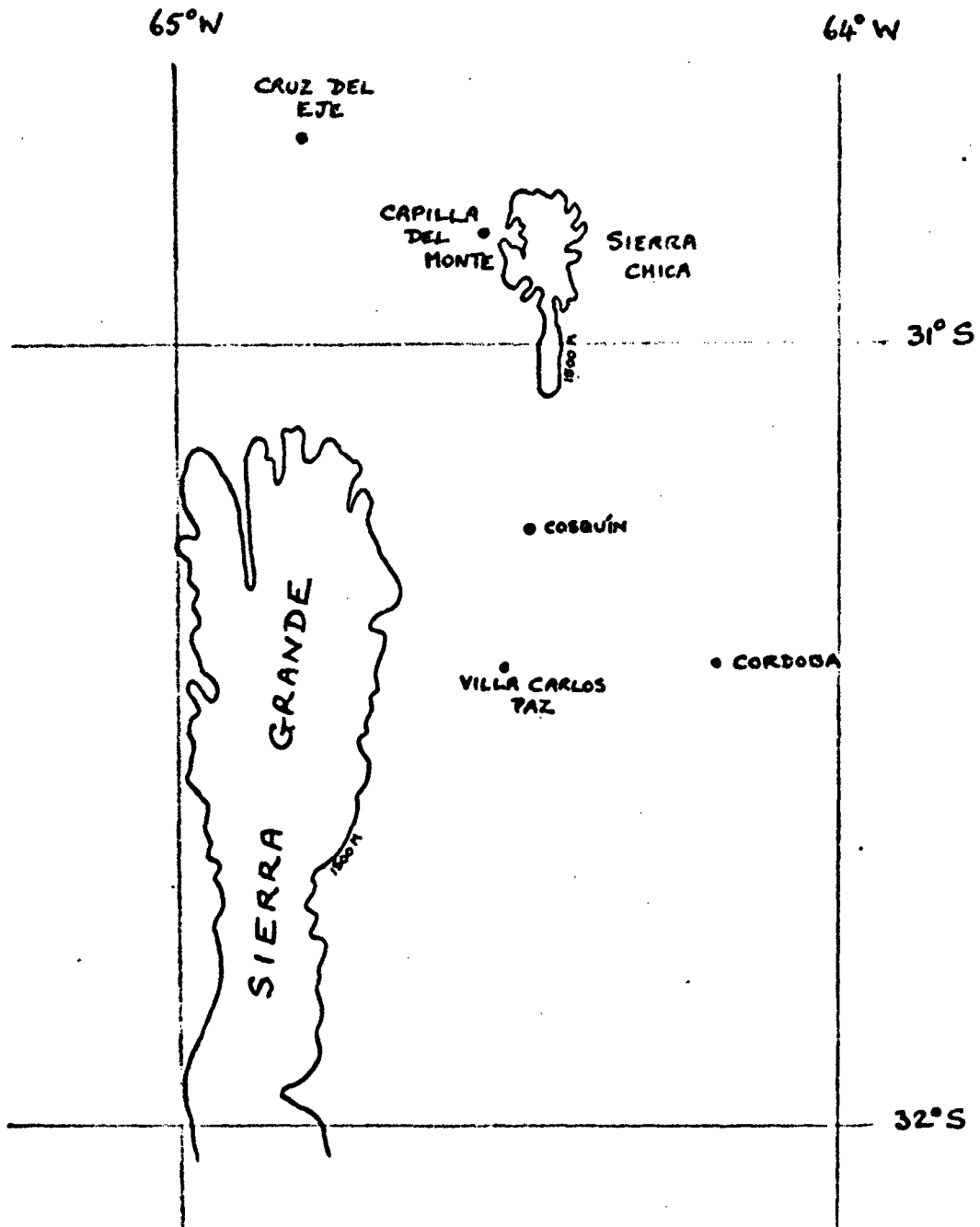
Habitat:

"Dry hills near Capilla del Monte" was the habitat given by Schick (1923) while Hosseus is quoted by Backeberg (1959) as giving the Sierra Chica as the habitat of this plant. This Sierra lies just to the east of Capilla del Monte. In 1965 Rausch (1972a) collected seed and plants from this same area. Buining (1972b) collected material "in the hills around Cordoba" during his expedition of 1968 while in the following year we are told (1971a) that a party from the Argentinian Cactus Society gathered plants in the vicinity of Villa Carlos Paz, near Cordoba and later, in the course of the same excursion, near Capilla del Monte, on the side of the road leading to Cruz del Eje. In 1971, seed of this species was offered by African Succulent Plant Society of Great Britain (1971b) as having been collected in habitat at Cosquín, Sierra de Cordoba.

Map references:

CAPILLA DEL MONTE	64°32'W	30°52'S
SIERRA CHICA	64°27'W	30°53'S
CORDOBA	64°11'W	31°25'S
VILLA CARLOS PAZ	64°31'W	31°25'S
CRUZ DEL EJE	64°48'W	30°44'S
COSQUÍN	64°28'W	31°14'S

Sheet: H20 - CORDOBA - FANTA FE



Part of the Province of Córdoba, N. Argentina.

Distribution of G. CAPILLAENSE Complex.

(Scale: 1" = 16 miles.)

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GYMNOCALYCIUM SIGELIANUM (Schick) Berger

A. Berger: Kakteen, p.220. 1929

Synonymy:

ECHINOCACTUS SIGELIANUS Schick, Möllers Deutsche Gärtnerei-
Zeitung, Vol.38, No.26, p.201. 1923.

Diagnosis:

Körper einfach niedergedrückt kugelig, hellgraugrün; bei 8 cm Durchmesser, 4 cm hoch, Scheitel eingesenkt, Wurzel dick rübenförmig. Rippen 11, stumpf durch scharfe Härchen getrennt, durch Querfurchen in Höcker gegliedert, die unterhalb der Areolen kinnförmig vorgezogen sind, Areolen etwa 2 cm voneinander entfernt, 7 mm im Durchmesser mit kurzem, gelblich weissem Wollfilz bedeckt, später vergrauend, schliesslich kahl. Randstacheln drei, davon zwei horizontal und einer nach unten gerichtet, gerade, auch einige sichelartig gebogen, dem Körper anliegend, 10 bis 12 mm lang, derb, im Neutrieb dunkelhornfarbig, später grau, stielrund und steif.

Ganze Länge der Blüten, zu mehreren sehr nahe am Scheitel, vor dem Aufblühen 8 cm. Die geöffnete Blüte ist 6 cm breit. Fruchtknoten 12 mm dick, mit halbkreisförmigen, hellgrünen, rötlichweiss berandeten Schuppen besetzt. Petalen fleischig rosa, mit grünem Mittelstreifen. Sepalen rosa mit dunklerem Mittelstreifen. Staubgefässe kürzer als die Hülle. Fäden und Beutel gelb, zahlreich. Griffel mit 12 Narben gelblich weiss. (Schick 1923).

This plant was one of the three rather controversial plants described by Schick (1923) in a single article published in Möller's *Deutsche Gärtner-Zeitung*, the other two being G. capillaense and G. sutterianum. The description was accompanied by a photograph of a plant in flower. He named the plant after Herr Carlos Sigel, a merchant of Capilla del Monte, who had collected the plants for him in the nearby Sierra de Cordoba. Some years after the original publication, Berger (1929) recognised the plant and transferred it from its original place in the genus Echinocactus to Gymnocalycium. Berger's description was not particularly detailed but differed somewhat from Schick's original. The later author gave the body-colour as brownish grey-green or dark brownish green while the original description have "pale grey-green". The plant body measured only 5 - 7 cm according to Berger, but Schick quotes "about 8 cm". In Berger's account, the rib number is 10, one less than that of Schick. The areoles are 10 - 12 mm apart in Berger's plants and have white wool at first, but the original description mentions short yellowish-white wool, later going grey before being lost altogether, and the areoles of Schick's plant were 20 mm apart. Backeberg (1959) obviously follows Berger's description very closely and ignores the original, and in the *Lexikon* (1965) merely adds "radials 3 - 5" instead of just "3", and "flowers pink" whereas no flower colour is mentioned in the author's previous work (1959). The *Lexikon* also states that the tube is moderately thick.

Description:

This is based entirely on the original description by Schick translated from the German, there being no Latin diagnosis.

Body simple, depressed spherical, pale grey-green; about 8 cm in diameter and 4 cm in height. Apex sunken, root stout, turnip-shaped. Ribs 11, blunt, separated by means of sharp furrows (?), divided up into tubercles by cross-furrows, the lower half of the tubercle below the areole drawn out into a "chin". Areoles about 2 cm apart, 7 mm in diameter, bearing short yellowish-white wool felt, later becoming grey, and ultimately becoming bare. Radial spines 3, of which two are horizontally arranged and one directed downwards, straight; also some bent into a sickle shape, appressed to the plant body, 10 - 12 mm long, stout, at first dark horn coloured, later grey, cylindrical and rigid. The overall length of the flower prior to opening is 8 cm. They appear close to the growing point. The open flower is 6 cm in diameter. The ovary is 12 mm wide, bearing semicircular scales which are pale green and have a reddish white border. Petals fleshy, pink with green mid-stripe. Sepals pink with darker midstripe. Stamens shorter than the perianth. Filaments and anthers yellow, numerous. Style with 12 yellowish-white lobes.

Habitat:

In the original description the habit was given as Capilla del Monte, in the Sierra de Cordoba, Argentina. Berger (1929) states merely Argentina, while Backeberg (1959) is more specific and gives the Sierra Chica as the origin of this species, probably basing his statement on Hosseus (1939). Little detailed information seems to be available.

For location of Capilla del Monte and Sierra Chica, see sketch map under G. capillaense.

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GYMNOCALYCIUM SUTTERIANUM (Schick) Hosseus*

Hosseus: Apuntes sobre las Cactáceas, Córdoba, Argentina, p.22. 1926

Synonymy:

ECHINOCACTUS SUTTERIANUS Schick, Möller's Deutsche Gärtner-Zeitung,
Vol.28, No.26, p.201, September 1923.

Diagnosis:

Körper halbkugelig mit eingesenktem, stachellosem Scheitel, graugrün, 8 cm Durchmesser $4\frac{1}{2}$ cm hoch, Rippen 9, senkrecht verlaufend, durch Querfurchen in Höcker geschieden, die unter den Areolen kinnartig vorstehen. Areolen 2 bis $2\frac{1}{2}$ cm voneinander entfernt, 6 mm lang und 4 mm breit, in jüngerem Zustand mit gelblich-weissem Wolfilz besetzt, aber bald verkahlend. Stacheln nur randständig 5, davon je 2 etwa $2\frac{1}{2}$ cm lang, schräg nach oben, 2 etwa 17 mm lang, horizontal zur Seite, 1 etwa 17 mm lang nach unten, dem Körper nicht dicht anliegend. Sämtliche Stacheln derb hornfarbig grau. Im Neutriebe dunkelhoniggelb.

Blüten zu mehreren am Rande des Scheitels. Vor dem Aufblühen 10 cm lang, vollständig geöffnet 6 cm Durchmesser. Fruchtknoten hellgrün mit halbkreisförmigen, weiss berandeten, in der Mitte des oberen Randes mit leichtem, rotem Fleck versehen. Blütenhülle breit trichterförmig. Äussere Blütenhüllblätter oblong, ziemlich fleischig weisslichrosa, mit hellgrünem Rückenstreifen, innere schmal spatelförmig, blassweisslichrosa mit dunklerem Mittelstreifen, am Grunde tief weinrot. Staubfäden zahlreich weiss, Beutel gelb. Griffel und die 9 Narben gelb. Beere spindelförmig 5 cm lang und $1\frac{1}{2}$ cm breit, graugrün, mit weisslichen Schuppen besetzt. (Schick 1923).

* Note: Berger is usually quoted as author of the transfer of this plant from Echinocactus into the genus Gymnocalycium, but Hosseus appears to have carried out this transfer three years earlier.

This plant was first described by Schick (1923) from a plant or plants found in a consignment of Cacti sent to him in June 1922 by acquaintances of his, living in Capilla del Monte, Argentina. He named it after one of the collectors, Herr Willi Sutter, a local merchant. Berger (1929) gives a description of this plant which differs somewhat from that of Schick. The body colour is said to be "dull dark green" rather than grey-green and off-sets are reported to occur from lower areoles. The rib number goes up from 9 to 10, young areoles have "white" wool rather than yellowish-white. Schick states that the radial spines are "only 5" in number, but the later author says "usually 5" and gives the colour as "greyish white" as opposed to "horn-coloured-grey, at first deep honey yellow" of the original description. Regarding the flowers, Berger describes the ovary and flower tube as "slender, longer than the flower petals". Schick however had not actually stated this, although he gave the overall length of the flower prior to opening as 10 cm and records that the berry is spindle shaped, 5 cm long by $1\frac{1}{2}$ cm diameter. His photograph also shows a flower having an undoubtedly long slender ovary and flower tube. Borg (1951) gives a brief description which agrees with that of Berger, but Backeberg (1959) adjusts Berger's description although giving the impression that he is quoting it verbatim. He omits "ovary and flower tube slender" and paraphrases Berger's "ovary and flower tube ... longer than the flower petals" to read "Petals shorter than the ovary tube". In a later paragraph, Backeberg states that the tube cannot be described as slender but that it is, on the contrary, robust like the other species in the group, G. sigelianum and G. capillaense, and goes on to say that the ratio between tube and petal length does not agree very closely

with Berger's statement, the petals and ovary tube being virtually equal in length. Backeberg gives no justification whatsoever for these rather dogmatic statements which contradict Berger's description of 30 years earlier and also, at least by implication, that of the original author, Schick himself.

Backeberg also suggests that the very problematical species G. stuckertii may belong here but examination of Spegazzini's own photograph of G. stuckertii published by Britton & Rose (1922) with Schick's photograph of G. sutterianum accompanying the original description, does not appear to support this hypothesis. For further discussion, see under G. stuckertii, and also comparative table under G. capillaense, G. sigelianum and G. sutterianum Complex.

In fairly recent years, seed of G. sutterianum has been offered commercially under the number FR 434, (1956-57) and U 185 (1961 - 62).
Description: (From the German text, there being no Latin diagnosis).

Body hemispherical, with sunken apex devoid of spines, grey-green, 8 cm in diameter and 4.5 cm in height. Ribs 9, formed vertically, split up into tubercles by cross furrows, and each tubercle produced into a "chin" below the areole. Areoles 2 - 2.5 cm apart, 6 mm x 4 mm broad, at first with yellowish-white wool felt, but soon becoming bare. Spines only radial, 5 in number, of which two are always inclined upwards, about 2.5 cm long, two arranged horizontally sideways about 17 mm long, and one about 17 mm long directed downwards, not appressed to the body. All the spines are robust, horn-coloured-grey, at first deep honey yellow. Flowers appear on the shoulder of the plant, 10 cm long before opening, 6 cm in diameter when fully open. Ovary pale green with semi-circular (scales) white bordered, and having a pale red spot in the middle of

the upper edge. Flower tube broadly funnel-shaped. Outer perianth segments oblong, somewhat fleshy, whitish pink with a pale green stripe on the back. Inner perianth segments narrow, spatulate, pale whitish-pink with darker mid-stripe, deep wine red at the base. Filaments numerous, white; anthers yellow. Style and the nine lobes yellow. Berry spindle-shaped, 5 cm long and 1.5 cm broad, grey-green, bearing whitish scales.

Habitat:

"The Sierra de Córdoba in Argentina" was all the information given in the original description. This is a very vague indication of the habitat as the mountains referred to run roughly north and south for a distance of some 440 Km in the province of Córdoba, Northern Argentina. Hosseus (1926) mentions only the province of Córdoba, as do other authors. The other two species described by Schick in the same article (1923) were said to come from the region around Capilla del Monte which is situated towards the northern end of the Sierra de Córdoba and which gives a very much more precise location for these plants. It might be assumed therefore that G. sutterianum also came from this area, but this must be checked against collected material as and when it becomes available. The soil around Capilla del Monte is described by Schick as being rich in humus and very fertile.

For sketch map see under G. capillaense.

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The G. capillaense, G. sigelianum
and G. sutterianum Complex

E. STUCKERTII For comparison. (See under G. sutterianum)

Features	E. CAPILLENSIS Schick 1923	E. SIGELIANUS Schick 1923	E. SUTTERIANUS Schick 1923	E. STUCKERTII Spegazzini 1905
Body	Depressed spherical, pike green, apex markedly sunken and being warty and almost devoid of spines and with scanty wool. 3.5 cm high, 6 cm ϕ .	Simple, depressed spherical, pale grey-green, apex sunken. 4 cm high 8 cm ϕ . Root stout and turnip shaped.	Body hemispherical, grey-green, apex sunken and devoid of spines. 4.5 cm in height, 8 cm ϕ .	Flattened spherical, moderate size, 60 - 65 mm ϕ , 30 - 40 mm high. Torus slightly concavo-umbilicate. Dark green, apex tubercled but nearly bare of spines. Sparse, short, bristly hair between tubercles. Habit of <u>E. hyptiacanthus</u> Lem. but smaller with tubercles on the ribs less well developed.
Ribs	9.	11. Blunt, separated by sharp furrows (?), divided up into tubercles by cross-furrows. The lower half of the tubercle drawn out into a "chin" below the areole.	9. Formed vertically, divided into tubercles by cross-furrows, tubercles drawn out into a chin beneath the areole.	Ribs 9 - 11 fairly robust, dentate, upper parts raised, acute, lower down towards the base, flattened and blunt. Usually formed from 3 - 5 tubercles, the latter fairly large and usually with acute bumps on the lower surface.
Areoles	4 mm ϕ , 2 cm apart.	7 mm ϕ , 2 cm apart. Bearing short yellowish-white wool felt, later becoming grey, ultimately the areole becoming bare.	6 mm x 4 mm, 2.0 - 2.5 cm apart. At first having yellowish white wool felt, but soon becoming bare.	Elliptical areoles 7 - 9 mm x 4 - 5 mm wide, rather widely separated (10-15 mm)
Spines	5, radials only. 15 mm long, pale horn coloured cylindrical, straight, and piercing.	3, radials only. 10 - 12 mm long, at first dark horn-coloured, later grey, cylindrical, and rigid. Two spines are arranged horizontally, and one is directed downwards. Straight, or sickle-shaped, appressed to the plant body.	5, radials only. Two are always inclined upwards, about 2.5 cm long, two arranged sideways about 17 mm long and one about 17 mm long directed downwards. They are <u>not</u> appressed to the body. All are robust, honey-coloured-grey, at first deep honey yellow.	Radials only, 7 - 9, 6 - 8 are lateral, one directed downwards. All appressed and moderately reflexed, ashen colour with darker (or brownish-grey G.J.S.) tips. Centrals always absent. Woody-rigid, 10 - 24 mm, coarsely scaly, dusty, flattened-circular in cross section.

E. STUCKERTII For comparison (Cont...)

Features	<u>E. CAPILLENIS</u> Schick 1923	<u>E. SIGELIANUS</u> Schick 1923	<u>E. SUTTERIANUS</u> Schick 1923	<u>E. STUCKERTII</u> Spegazzini 1905
Flower in general	Arising from the upper, spined, areoles. Length before opening 8 cm, diameter when open 6 cm. Completely naked on the outside and bearing semi-circular greenish white scales. Perianth segments moderately fleshy and spatulate ivory coloured with green stripe on the back. Inner ones lanceolate, ivory white with pale pink mid-stripe and wine red throat.	Arising close to the growing point, overall length before opening 8 cm. Diameter when open 6 cm. Ovary is 12 mm wide bearing semicircular scales which are pale green and have a reddish-white border. Petals fleshy, pink with green mid-stripe, sepals pink with darker mid-stripe.	Appearing on the shoulder of the plant. 10 cm long before opening, 6 cm diameter when fully open. Ovary pale green with semicircular scales, white bordered and having a pale red spot in the middle of the upper edge. Flower tube broadly funnel-shaped. Outer perianth segments oblong, somewhat fleshy, whitish pink with a pale green stripe on the back. Inner perianth segments narrow, spatulate, pale whitish pink with darker mid-stripe. Deep wine red at the base.	Often solitary, arising from the edge of the torus, erect, medium size, 4 cm Ø, not scented. Scales on the outside semi-circular, purplish-green and quite robust, with white margins tinged with violet, gradually merging into the petals above which are somewhat fleshy. No hair or spines on flower. Flower tube becomes dark bluish green. Petals almost spatulate, with long and narrow claws. Flower colour from white to almost pink.
Stamens	Stamens and anthers yellow.	Shorter than the perianth. Filaments and anthers yellow. Numerous.	Numerous. Filaments white, anthers yellow.	Filaments and pollen yellowish.
Style and stigma	Style with 10 stigma lobes, yellowish-white.	Style with 12 stigma lobes, yellowish-white.	Style with 9 stigma lobes, yellow.	Style greenish with 12 white stigma lobes.
Fruit	Berry spindle shaped, 4 cm long, 1.5 cm in diameter. Bluish green with white scales.	---	Berry spindle shaped, 5 cm long, 1.5 cm in diameter. Grey-green bearing whitish scales.	---
Habitat	Argentina: From dry hills near Capilla del Monte.	Argentina: Capilla del Monte in the Sierra de Cordoba.	Argentina: Sierra de Cordoba.	In very dry hills, provinces of San Luis, Cordoba, Tucuman and Salta, Argentina.

The Complex of species centred around Gymnocalycium capillaense,
G. sigelianum and G. sutterianum

If one compares the original descriptions of the three plants named above,
the following facts emerge:-

<u>G. CAPILLAENSE</u>	<u>G. SIGELIANUM</u>	<u>G. SUTTERIANUM</u>
Shape flattened spherical	Shape flattened spherical	Shape hemispherical
3.5 cm high, 6 cm ϕ	4 cm high, 8 cm ϕ	4.5 cm high, 8 cm ϕ
Pike green	Pale grey-green	Grey-green
---	Root stout and turnip-shaped	---
Areoles 4 mm ϕ , 2 cm apart	Areoles 7 mm ϕ , 2 cm apart	6 mm x 4 mm, 2.0 - 2.5 cm apart
---	Short yellowish-white wool \rightarrow grey \rightarrow bare	Yellowish-white wool \rightarrow bare
5 radial spines, 15 mm long	3 radial spines, 10 - 12 mm long	5 radials, 2 @ 2.5 cm long, others 17 mm long
Pale horn-coloured, cylindrical, straight and piercing	Dark horn-coloured \rightarrow grey, cylindrical and rigid, straight or sickle-shaped. Appressed	All robust honey-coloured to grey, at first deep honey yellow. NOT appressed.
Ribs 9	Ribs 11	Ribs 9
Flowers arising from upper spined areoles	Flowers arising close to the growing point	Flowers appearing on shoulder of the plant
Buds 8 cm long, 6 cm ϕ open	Bud 8 cm long, 6 cm ϕ open	Bud 10 cm long, 6 cm ϕ open

<u>G. CAPILLAENSE</u>	<u>G. SIGELIANUM</u>	<u>G. SUTTERIANUM</u>
Flower tube with semi-circular greenish-white scales	Flower tube with pale green semi-circular scales with reddish-white border	Semi-circular scales (pale green ?) white bordered, pink spot at centre of upper edge
Perianth: Outer - moderately fleshy, spatulate ovary with green stripe on back. Inner - lanceolate, ivory, pale pink mid-stripe	Perianth: Outer - pink with darker mid-stripe Inner - pink with green mid-stripe	Perianth: Outer - somewhat fleshy, oblong, whitish pink, pale green stripe on back. Inner - narrow spatulate, pale whitish pink with darker mid-stripe
Flower with wine-red throat	---	Flower with deep wine-red throat
Filaments and anthers yellow (Stamens in text)	Filaments and anthers yellow, shorter than perianth, numerous	Filaments white, anthers yellow, numerous
Stigma and style yellowish white, 10 lobes	Stigma and style yellowish white, 12 lobes	Stigma and style yellow, 9 lobes
Fruit bluish green, spindle shaped, 4 cm x 1.5 cm, white scales	---	Fruit grey-green, spindle-shaped, 5 cm x 1.5 cm whitish scales

Regarding the colour "pike green", the present author regretably has been unable to find a definition of this colour but presumably it is some shade of grey-green. In several instances the descriptions are not consistent in that the nature of the root in G. sigelianum is commented on but no information given regarding the roots of the other two species. Similarly the colour and duration of areole wool in G. capillaense is omitted, no mention is made of the presence or absence of a red throat in G. sigelianum, and no details are given of the fruit in that plant. It should also be noted that it seems highly likely that sepals and petals have been confused in the description of G. sigelianum. In the German text, petals are mentioned before sepals, the reverse of the usual sequence, and the former are said to have a green mid-stripe. While not impossible, this seems extremely unlikely in petals but is quite normal in sepals within the genus Gymnocalycium. When referring to the androecium, Schick also appears to be confused regarding the relative identities of stamens, anthers and filaments. Under G. capillaense he gives anthers and stamens yellow instead of anthers and filaments, while under G. sigelianum the terms are used correctly. Under G. sutterianum however, he describes the filaments as white and the anthers yellow but applies the term "numerous" to the filaments instead of using the word for stamens.

Considering these inconsistencies and inaccuracies alone, the value of the descriptions becomes a little doubtful and although the differences tabulated here are quite numerous, when considered in the context of a taxonomic study, they would appear to have little if any

significance unless they could be justified by field studies of large numbers of plants. In fact, Schick seems to have received relatively few collected plants upon which to base his descriptions. According to Schütz, (1963) the then editor of the German Cactus Society Journal was convinced that Dr. Spegazzini had explored the cactus vegetation of Argentina so thoroughly that it was not possible to accept the discovery of further species, hence the appearance of the article in Möller's Deutsche Gärtner-Zeitung instead of the Cactus Society publication. Although this seems a rather arbitrary and unwarranted assumption on the editor's part, one has a certain amount of sympathy with him when one reads of Schick's claim to have received in the one consignment from Argentina, not only six new species (including the three under discussion) but also varieties of other cacti whose occurrence in the area in question seemed rather unlikely. Never-the-less Berger (1929) was willing to accept G. sigelianum and G. sutterianum as valid species but omitted G. capillaense. Backeberg (1935) however, accepted this last plant as a separate entity. Hosseus on the other hand, a Botanist who had himself collected plants in the area concerned was not prepared to accept that three different specific names were warranted and would have preferred to see them grouped as a single variable species. He states (1939) "... not only does one find transitional forms but in the very same plant, one finds areoles with 3, 5, and even seven spines. Similarly, the flowers and fruit vary." Schütz (1963) would still prefer to see three separate names retained and points out some of the differences tabled above. He makes the statement that G. sigelianum has no wine-red throat to the flower, but this would appear to be only by inference,

as Schick does not actually state this. Schütz also adds that G. capillaense shows the greatest tendency to off-set, forming clumps at an early age. In the other two species, off-sets are said to appear only on mature plants. This latter information is presumably based on his own personal experience of growing plants under three names in Europe. Unfortunately it is only too easy to accumulate in cultivation only those plants which fit the descriptions available, or to propagate isolated specimens (especially such as those which off-set so readily) by vegetative means and thus distribute clonal material, creating a possibly false idea of "the true species" to use a phrase beloved of the keen amateur collector. Nowadays also, political and monetary barriers restricting the free interchange and importation of habitat collected material tend to increase the chances of such false ideas being perpetuated.

Schütz also mentions amongst surviving old imported plants in Czechoslovakia, "a beautiful form of G. sigelianum with white spines and splendid flowers" and he also refers to a beautiful red-flowering variety of G. sutterianum illustrated in Haage Jr.'s Catalogue for 1928, but now apparently lost. Backeberg (1959) also mentions the plant as G. sutterianum var. rubriflorum and records that it was collected by Hosseus in Córdoba and sent by him to Europe. The plants collected by Lau during 1970/72 in the Sierra Medina, under number Lau 439, would seem similar to those mentioned here, and it is extremely likely that all these red flowered and/or white spined plants really belong under G. baldianum. It appeared to have a pale green body colour and the flowers were a deep blood-red colour.

Backeberg (1959) recognises only G. sigelianum and G. capillaense as worthy of specific status and although describing G. sutterianum under the heading of a species, states that he regards it merely as a form and it does not feature in his key for this group of plants. It is possible that he might have thought differently had he referred to Schick's original description and photograph where the disputed long slender flower tube and ovary (see under G. sutterianum) is clearly shown.

More recently Frank (1970) has proposed, on the basis of his study of fresh material imported from habitat, that one variable species be recognised under G. capillaense (because of the geographical connotations of the specific name) and the other two names, if it was considered necessary, be retained as forms only. This would appear to be the sensible solution to the problem at least until detailed habitat studies indicate an alternative.

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No.8, p.70.

Group G

1. G. calochlorum

This species is placed in a group on its own because the present author's knowledge of the living plant is too limited at this stage to justify inclusion with either Group F or Group H. It appears to resemble the latter species in habit but not in the flower, and while the habit of those plants in Group F is very different, there seems to be a similarity in the flowers. It is not possible to resolve this problem satisfactorily at present.

GYMNOCALYCIUM CALOCHLORUM (Böd.) Y. Ito

Y. Ito: Explanatory Diagrams of Austroechinocactanae, p.197. 1957.

Synonymy:

ECHINOCACTUS CALOCHLORUS Bödeker, Monatsschrift der Deutschen
Kakteen-Gesellschaft. Volume 34, pp.260 - 262. 1932.

ECHINOCACTUS PROLIFER* Backeberg, Der Kakteen-Freund, pp.132, 133. 1932.

GYMNOCALYCIUM PROLIFERUM var. CALOCHLORUM (Böd.) Backeberg
Kaktus ABC, p.295. 1935.

Diagnosis:

Depresso-globosus, simplex vel parce proliferans, vertice vix
depressus aculeisque sparsis superatus; costae 11, tuberculatae; areolae
breviter lanuginosae, mox glabrescentes; aculei ad 9, radiales (centralibus
deficientibus) tenues, cani, exasperati, ⁺ incurvati vel appressi,
ad 9 mm longi. Flores solitarii verticem juxta orti, 5 - 6 cm longi;
ovarium tubusque squamis praedita; phylla interiora ⁺ lanceolata, pallide
rosacea; filamenta albida, antherae flavidae; stylus brevis, crassus
pro rata, rosaceus, stigmatibus ca. 10 flavidis; semina parva,
⁺ globosa, nigra, opaca. (Bödeker 1932).

Variety:

GYMNOCALYCIUM CALOCHLORUM var. PROLIFERUM (Bckbg.) Backeberg
Die Cactaceae, Volume 3, p.1718. 1959.

Synonymy of the variety:

ECHINOCACTUS PROLIFER* Backeberg, Der Kakteen-Freund, pp.132,133. 1932.

GYMNOCALYCIUM PROLIFERUM (Backeberg) Backeberg, Kaktus ABC, p.295. 1935.

* This name appears twice above as the description appears to have been based on a mixture of two types of plant which later were separated into a species and a variety of the species.

First description:

Pflanze klein, 2 - 6 cm gross werdend, ziemlich flach, kräftig, dunkelgrün, aus Areolen und Wurzel sprossend und bald grossere Polster bildend.

Rippen: Bis zu 11, breit und niedrig, in Höcker geteilt, die unter der Areole einen kinnartigen Vorsprung haben und von einander durch eine kräftige Querfurche getrennt sind.

Areolen: Bis zu 15 mm entfernt, etwas länglich und anfangs mit kräftigem, gelblichweissem Filz versehen. Randstacheln: meistens neun, vier rechts und links dem Körper angedrückt und 7 - 10 mm lang, ein ca. 6 mm länger Randstachel gerade nach unten zu anliegend. Mittelstachel: fehlt stets. Stachelfarbe schmutziggrau.

Blüte: Grosse, bis $5\frac{1}{2}$ cm lang, Röhre und Knospe blaulichgrün, porzellanartig mattglänzend. Schuppen breit und kurz, weiss gerandet. Äussere Blütenblätter ca. 25 mm lang, hellbräunlichweiss mit olivgrünem Mittelfeld, innere Blütenblätter hellbräunlichweiss. Alle am Fuss gerötet und an der Spitze leicht gerundet.

Stempel: und Staubgefässe gelbl. weiss. (Backeberg 1932).

Note:

Schütz (1963) has suggested a new species name - G. pseudocalochlorum for a plant which appears to be very close to the variety proliferum above. No Latin diagnosis was given and the Czech description very brief. No illustration was provided. Consequently the name has been ignored.

This plant was first described by Bodeker (1932a) as Echinocactus calochlorus. He obtained the plant in the summer of 1930 from Hahn, who in turn had received it from Stumer who was collecting in N.W. Argentina at that time. Bodeker quotes Dr. Rose as saying that it belonged to the genus Gymnocalycium but rather strangely persists in retaining it within the larger genus Echinocactus. A short while later, Backeberg (1932b) described a plant under the name of Echinocactus (Gymnocalycium) prolifer which he had also received from Stumer in the year 1932. It would seem that Bodeker had but a single specimen to work on (plus, as he himself records, a flower from Hahn and a fruit from Andreae!), while Backeberg had a considerable stock of plants, and as a result of further study, the latter came to the conclusion that two closely related species might be involved. Consequently, the Backeberg name, now altered to G. proliferum, persisted in Kaktus ABC (1935) to accommodate the second type of plant. Unfortunately, on Backeberg's own admission (1959) the illustration accompanying the description matched not G. proliferum but the original Bodeker plant! In the same publication, Bodeker's plant was described under the name of G. proliferum var. calochlorum (Bod) Backeberg, Backeberg not yet choosing to recognise Bodeker's priority. Later, Y. Ito (1957) transferred Bodeker's plant to the genus Gymnocalycium, first in 1952 as a comb. nud. and then validly in his Explanatory Diagrams in 1957, quite correctly ignoring the varietal status bestowed on it by Backeberg. It thus became G. calochlorum (Böd) Y. Ito. In Die Cactaceae (1959) Backeberg accepts that Bodeker's description had priority over his own (as E. prolifer) and that G. calochlorum (Böd) Y. Ito was now the correct name. In

addition, he makes a new combination reducing his own G. proliferum to a variety of Bödeker's plant, i.e. G. calochlorum var. proliferum (Backbg) Backeberg. This would seem a very reasonable step to take considering the obviously close relationship between the plants. In the same publication, he also illustrates his idea of the two plants in a single photograph for the sake of comparison. However, on comparing the descriptions of E. prolifer (1932b) and G. calochlorum var. proliferum (1959) (unfortunately the Danish text of Kaktus ABC is not available in English), certain discrepancies become obvious. The size of individual heads in E. prolifer is given as from 2 to 6 cm in diameter while variety proliferum is said to be "about 5 cm in diameter being somewhat larger than the type" whereas Bödeker quoted his plant as being 6 cm in diameter! The size of the areole is also a source of confusion. E. prolifer is said to have areoles "somewhat elongated" while at first it is said that variety proliferum has areoles about 1 mm in diameter (Bödeker's E. calochlorus 1.5 mm in diameter). In a later paragraph however, Backeberg states the areoles to be 7 mm x 4 mm! These discrepancies are difficult to explain, but as regards the remainder of the two Backeberg descriptions, it is probably fair to say that the changes between E. prolifer and variety proliferum (supposedly the same plant) were made because at the later date the author had had further opportunity to separate the two types from his mixed batch of plants and study them, and that the second amended description holds good for his idea of G. calochlorum var. proliferum.

Schütz (1963) in a critical survey of these plants does not accept this state of affairs however, and regards E. prolifer as a synonym of G. calochlorum. This may be acceptable in practice if not in theory

as it could well have been the product of a "hybrid" description based on two types of plant, but when he states that "the description of G. proliferum (in Kaktus ABC 1935) is fundamentally different" but then later goes on to reduce it also to synonymy with the same plant as E. prolifer, it becomes less easy to accept his views. He points out some of the differences which do in fact exist (vide supra) but he surely errs when he says that the spines of G. proliferum are "pinkish". The original of Backeberg says "yellowish pinky-white" - a vague description indeed, but hardly warranting reduction to "pinkish". Schütz maintains that another plant was in fact substituted in some mysterious way for the original E. prolifer, but the real explanation of this is given quite clearly by Backeberg (1959). Ignoring this, he then proceeds to provide a name for the "pink" spined plant that he envisages Backeberg to have substituted for the real G. proliferum. He proposes G. pseudocalochlorum and describes it as follows:-

"Body dark green with a touch of blue, areoles large, retaining the felt for a long time. Spines 9 - 13, much longer (than G. calochlorum) and noticeably pink. Not off-setting very freely." The only points of difference from Backeberg's variety proliferum appear to be the rate of production of off-sets and a rather doubtful difference in spine colour, hardly the basis, one would think, for a new species, especially when the same author has already reduced a very similar plant to synonymy under another species! The logic is hard to follow but may, of course, have suffered in the translation.

In addition to the problems outlined above, the present author has several un-named specimens in his collection which do not in detail agree with any of the foregoing descriptions, but because of

their general appearance, flower characteristics and seed type, must surely be members of this group of plants.

Consequently it would appear that here, as elsewhere within the genus Gymnocalycium one has to deal with a closely related group of plants which cannot easily be divided up into well-defined sub-units. No useful purpose is served, therefore, by attempting to publish further taxa until details of variation and distribution in habitat are forthcoming, in order to make it profitable once again to look at possible reorganisation within the group. Until such information becomes available, the present author prefers to retain the species G. calochlorum and its variety proliferum as defined by Backeberg (1959) but at the same time, bearing in mind that plants exist in collections and possibly in habitat that do not fit into these taxa and which will need to be accommodated in the future.

Habitat material from Friedrich Ritter has come into Europe in fairly recent years under his collection number FR 440 and seemingly bearing the name G. proliferum, while Rausch, from his expedition of 1965, has introduced collected material under the name G. calochlorum and bearing his collection number R 107. In the case of Rausch's material, the source is given as Sierra Grande, Córdoba, but Ritter gives no habitat details.

Description:

The following description is based exclusively on the Latin diagnosis and German description of Bödeker (1932a).

Body spherical, somewhat flattened, off-setting rather rarely, either from the base or somewhat higher up. Plants up to 4 cm in

height and 6 cm in diameter, body colour a beautiful shining pale green, later becoming a little darker. The top of the plant is flat, with the growing point hardly sunken at all, and more or less sparsely covered over with young spines. Ribs 11, divided up into tubercles by sharp longitudinal and cross furrows; the tubercles in the lower portion of the plant are in the region of 1.5 cm broad, and in addition they are rounded on the upper surface and drawn out into strong chin-like projections beneath the areole. Areoles about 1.5 mm in diameter with short white wool; in the upper part of the plant, they are situated in the cross-furrows of the ribs, but later appear lower down, occupying the upper third of the tubercle and here becoming somewhat barer of wool, finally becoming glabrous. Spines up to 9 in number, all radial, directed sideways and downwards, about 9 mm long, slender, rough, greyish-white, the young ones faintly pinkish when moist, all to some extent incurved or appressed and frequently tangled together. The flowers are solitary in the vicinity of the growing point. Length of the whole flower 5 - 6 cm, and the same in diameter when fully open; the ovary or tube alone is 3 cm long, about 1 cm thick, narrowing to 0.5 cm below. It is shining dark leaf-green, with spirally arranged scales 1 cm apart. The scales are white, roundish, pointed, and 4 mm in breadth. They gradually pass into the 1 - 2 cm long, 7 mm broad outer perianth segments, which are oblong, pink with a grey-green point and a sharp pale border. The inner perianth segments are linear lanceolate, 7 mm broad and 3 - 4 cm long (innermost ones somewhat shorter) more or less moderately pointed, sharp edged, pale pink in colour with

darker mid-stripe and a greyish-pink tip. The throat of the flower is more rose-carmine in colour. The filaments of the stamens are white, anthers pale yellow. Style short and relatively thick, completely pink, with about 10 short yellow stigma lobes. The fruit is more or less egg-shaped, 6 - 12 mm in size. Seed about 1 mm in size, spherical to cap-shaped, black, with dull lustre and with long, mouth-shaped, white lipped hilum.

G. calochlorum var. proliferum:

The description here is that of Backeberg (1959).

Plant body dark to bluish leaf-green, with large tap-root. It off-sets prolifically later building up multi-headed cushions. Single heads up to about 5 cm in diameter, the apex only slightly depressed and somewhat felted with wool. Ribs up to 12 in number, 8 mm wide with slightly rounded tubercles under the areoles, and a cross-furrow beneath. Areoles up to 1.5 cm apart, about 1 mm in diameter^{*}. Spines up to 13 in number but may be as few as 6 or 7, and up to 11 mm or over in length, appressed, much longer than those of the type species, interwoven one with another, yellowish pink-white. Flowers with stronger, longer, and blue-bloomed tube. Petals much longer than in the type species, loosely spreading and bent over at the ends, giving a flower with broader perianth. Petals of a brownish-white colour rather than pink to pure white, often with a pink throat. Fruit longish, blue-green, with broad scales. Seed black.

Backeberg then points out that the body colour is darker than the bright green of the type, the apex of the plant less bare. The areoles are up to 7 mm long and 4 mm wide^{*}, bearing yellow, slightly dirty wool which persists for a longer time.

* Note discrepancy in the size of the areole!

Habitat:

Information regarding the habitat of this species is very limited indeed. Bödeker (1932a) presumed it to be "N.W. Argentina" because the collector from whom he received the material usually worked in that area. Backeberg (1932b) under E. prolifer, gives "Córdoba, Argentina" but later (1959) under G. calochlorum, gives only "Argentina, habitat not known". Markus & Rausch (1968) record having found G. proliferum in the Sierra Chica and also at Nono, on the western side of the Sierra Grande. Buining (1972) confirms the occurrence of "G. prolifer" at Nono.

Map references:

SIERRA CHICA	64° 27' W	30° 53' S
SIERRA GRANDE	64° 50' W	31° 33' S
NONO	65° 01' W	31° 48' S

Sheet: H 20 - CÓRDOBA - SANTA FE

(For sketch-map, see under G. bruchii).

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Gesellschaft. Volume 34, pp.260 - 262.
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- 1963 SCHÜTZ, B., Friçiana, No.16.
- 1965 BACKEBERG, C., Kakteenlexikon, p.165.

GYMNOCALYCIUM BRUCHII (Speg.) Hosseus

Hosseus: Apuntes sobre las Cactáceas, p.133, In Revista del Centro Estudiantes de Farmacia, Córdoba, Volume 2, Nr.6, 7, 1926 (Sep. p.22)

Note: On page 22 appears the name "G. bruchii (Br. & R.) Hosseus" instead of G. bruchii (Speg.) Hosseus, which appears in the same author's publication of 1929. However, the intention to place the plant in the genus Gymnocalycium is quite clear and the earlier date is retained.

Synonymy:

FRAILEA BRUCHII Spegazzini, Breves notas Cactológicas. In Volume 96, Anales de la Sociedad Científica Argentina, Buenos Aires, p.72. 1924.

GYMNOCALYCIUM LAFALDENSE Vaupel, Zeitschrift für Sukkulantenkunde, Heft 14, p.192. 1924.

GYMNOCALYCIUM BRUCHII (Br. & R.) Hosseus, Apuntes sobre las Cactáceas, p.133. (Sep. p.22) In Revista del Centro Estudiantes de Farmacia, Córdoba, Volume 2, Nr. 6, 7, 1926.

GYMNOCALYCIUM BRUCHII (Speg.) Hosseus, Fedde Repertorium Spec. Nov. Volume 27, p.256. 1929-30.

ECHINOCACTUS LAFALDENSIS (Vpl.) Berger, Kakteen, p.227. 1929.

GYMNOCALYCIUM BRUCHII (Speg.) Osten. Notas sobre Cactaceas, In Anales del Museo de Historia Natural de Montevideo, p.75. 1941.

GYMNOCALYCIUM BRUCHII (Speg.) Backeberg. Wrongly attributed to Backeberg by various writers, e.g. Borg. Cacti, p.303. 1951.

Diagnosis:

Cormus globulosus, parvus, dense botryoso - caespitosus, costis 8 - 12, parum manifestis, in tuberculis subconoido-hemisphaericis solutis, areolis parvis ellipsoideis spinulis 12 - 14 gracilibus, omnibus radiantibus sub-cylindricis papilloso - asperulis adpressis recurvis albis, floribus

solitariis v. paucis majusculis companulatis, tubo extus squamuloso - villosulo, petalis oblanceolatis acutiusculis roseo - violaceis, straminibus, stylo stigmatibusque flavicantibus. Fructus adhuc ignotus. (Spegazzini 1923).

Varieties:

1. var. HOSSEI Backeberg, Die Cactaceae, Volume 3, p.1699. 1959.

Synonyms:

var. HOSSEI Backeberg & Knuth, Kaktus ABC, p.286. 1935.
(but without diagnosis).

G. LAFALDENSE f. HOSSEI (Backeberg) Oehme. In Cactaceae, Jahrbucher der D.K.G. Erster Teil, pp.29. 1941.

Diagnosis:

Differt a typo phyllis perigonii laxè ordinatis, interdum
+
- contortis, cuspidatis. (Backeberg 1959).

2. var. ENORME (Oehme) Backeberg, Kakteenlexikon, p.165. 1965.

Synonym:

G. LAFALDENSE f. ENORME Oehme, In Cactaceae, Jahrbucher der D.K.G. Erster Teil, pp.29a & 30a. 1941.

Diagnosis:

Ad 5 cm dimetiens; aculei breviores robustiores vitreo-albi, interdum aculeo mediano; flores 5 - 5.5 cm longi et lati, rosei; tepala interiora obscura latiora opace-nitida; tepalis exterioribus stria mediana dilute-viridula, interioribus violaceo-rubra; pericarpellum breve laete-carneum squamatum; antherae et pistillum eburneae; pistillum 8-stigmatum antheras superans; fructus robustus ad 1.5 cm, dilute-viridis pruinosis oligonitidis. (Oehme 1941)

Forms:

A number of forms have been described and they are listed here for the sake of completeness but the validity of some or possibly all of them is open to question.

1. G. BRUCHII f. CANDIDA nomen nudum.
2. G. LAFALDENSE f. DEVIATUM Oehme, Cactaceae, Jahrbucher der D. .G, Erster Teil, p.30a, 1941.

Diagnosis:

Robustior, ad 4 cm dimetiens; aculei robustiores, eburnei, patententes; areolae maiores, opulente eburneo-lanatae; flores plus coarctati 3.5 - 4 cm longi et lati, rosei; omnibus tepalis stria mediana fusco-viridis; faux laete-rosea; pericarpallum typo robustius obscure-fusco-viridis; squamae typo crebriores robustiores virides, dilute viride-marginatae; antherae et stylus 7 stigmatus eburnae; pistillum antheras superans; fructus parvus globosus fusco-flavo-viridis, pruinosis. (Oehme 1941).

3. G. LAFALDENSE f. EVOLVENS Oehme. (Ibid)

Diagnosis:

Ad 5 cm dimetiens; plantae floriferae areolis 20 aculeis lateralibus et semper ad 3 aculeis medianis eburneis basi laetafuscis; flos robustus 3.4 - 4 cm longus et latus coarctatus roseus; tepala acuta stria mediana fusca flavo-viridi; pericarpellum coarctatum breve magnis squamis irregularibus flavo-viride marginatis; pistillum 4 - 5 stigmatum eburneum antheris superatum; fructus brevis, ca. 1 cm, oleo-viridis, oligonitidus lateraliter dehiscens, siccans. (Oehme 1941)

4. G. LAFALDENSE f. FRATERNUM Oehme. (Ibid)

Diagnosis:

Ad 3.5 cm dimetiens; areolae semper aculeis medianis sordide eburneis instructae; flos ad 3.5 - 4 cm longus et latus; tepala rosea, interiora stria mediana obscuriora, exteriora flavo viridia; pericarpellum parvum globosum totum dilute-viride; squamae laxae latae dilute-roseo-marginatae; pistillum et stigmata 5 eburnea; pistillum antheras superans; fructus parvus globosus dilute-viridis; flores Gymn. albispini subsimilis. (Oehme 1941).

5. G. LAFALDENSE f. INTERMEDIUM Hort. Simon, Kakteen und andere Sukkulente, Vol. 24, No.8, p.186. 1973. (Without diagnosis).

First description:

Bildet einen Übergang von deviatum zur nächsten form enorme. Körper bis 5 cm Durchmesser, Stacheln wie deviatum aber ohne Mittelstacheln, Blüten 4 cm Durchmesser, blassrosa ohne deutlichen Mittelstreif. (Simon 1973).

6. G. LAFALDENSE f. SPINOSISSIMUM (Hge. Jr.) ex Simon (Ibid)

Synonyms:

G. LAFALDENSE SPINOSISSIMUM Haage Jr. nom.nud.

G. BRUCHII SPINOSISSIMUM (Haage Jr.) Y. Ito, nom.illegit.

Diagnosis:

Differt a typo corporibus majoribus ut videtur ad 15 cm alta et 7cm diam., spinisque longioribus, ad 20 mm longis. (Simon 1973)

7. G. LAFALDENSE f. ROSEIFLORUM Hort. nom.nud.

Note: For G. lafaldense f. albispinum Oehme, see under the species

G. albispinum.

This species known variously in collections today as G. bruchii or G. lafaldense, was probably described in the first instance as "Frailea bruchii" by Spegazzini (1923). The name commemorates Dr. Carl Bruch who, in 1918, collected the original material for the author. In his description he says that the flower has a very short tube "scattered with reddish-green linear scales with a little tuft of hair and sometimes a weak bristle in the axils." While this might be appropriate to a Frailea, it completely rules out any normal species of Gymnocalycium, though it could possibly be said of a plant showing atavistic tendencies, as has been instanced in other genera such as Rebutia by Backeberg (1959). However, the photograph which accompanies the description by Spegazzini would most certainly appear to be of the plant now known as G. bruchii or G. lafaldense. Backeberg (1959) refers to a statement by Castellanos that Spegazzini was working very much from memory, a fact hard to believe but one which could certainly explain the confusion, for the species concerned does indeed appear superficially rather similar to some of the small clump-forming Fraileas. Simon (1963) takes this argument further and suggests that "Frailea bruchii" might have been one of the forms of Frailea pygmaea which according to him are in some cases indistinguishable from G. lafaldense until the buds appear. This does little to support the thesis however, as although there are white spined forms of this plant, the flowers are yellow and Spegazzini clearly states the flower colour of "Frailea bruchii" to be pink. The distribution of Frailea pygmaea (which incidentally was also first described by Spegazzini) would appear to be Entre Rios (Argentina) and Uruguay. The area of Alta Gracia, the source of Spegazzini's "Frailea bruchii" is over 350 Km away in a direct line from the nearest point in

Entre Rios. In addition, Backeberg (1959) asserts that no plants similar to "Frailea bruchii" occur in the province of Córdoba. As Hosseus points out (1929b), Britton & Rose (1922) characterised the genus Frailea, at least in part, as having "the top of the fruit not spinose, seeds not pitted, shell-like, plants very small", and as Spegazzini admits to not having seen the fruit and seed of the plant he describes, it becomes even more likely that he made a mistake in allocating the plant to the genus Frailea.

Hosseus (1926) expresses the view that the plant should be transferred to the genus Gymnocalycium and suggests the new combination G. bruchii (Br. & R.) Hosseus, with F. bruchii Spegazzini and G. lafaldense Vaupel as synonyms. In a later publication (1929b) he gives G. bruchii (Speg.) Hosseus which appears to be the correct version, as Britton & Rose do not mention either F. bruchii, G. bruchii or G. lafaldense at all in their work on the Cactaceae 1920-1924. Hosseus also carefully compares the original descriptions of "Frailea bruchii" Spegazzini and G. lafaldense Vaupel, a similar plant whose description was published in 1924, and has shown quite convincingly that they were in fact virtually identical, thus justifying his relegation of the latter plant to synonymy with Frailea (later Gymnocalycium) bruchii. In the same publication he remedies the omission of both Spegazzini and Vaupel by describing the fruit and the seeds.

Berger (1929a) transferred the plant (as G. lafaldense) to Echinocactus, while Osten (1941a) published the name G. bruchii (Speg.) Osten as a new combination but this post-dates that of Hosseus by fifteen years, and is therefore superfluous. Oehme (1941b) however, insists that Spegazzini's plant is an unknown Frailea species, and that the only valid name for the plant in question is that of Vaupel, i.e. G. lafaldense.

He also recognises a number of forms of G. lafaldense.

Backeberg (1959) accepts the name G. bruchii (Speg.) Hosseus, and mentions the various forms of the plant described by Oehme (as forms of G. lafaldense) but seems somewhat doubtful as to their validity. One however, forma hossei, he regards as worthy of varietal status and he had previously published it as such in conjunction with Knuth (1935a) but without a Latin diagnosis, the latter being provided for it in his publication of 1959. A second form, forma albispinum, had also already (1935b) been described by him as a species in its own right. G. bruchii spinosissimum (Hge.Jr.) Y. Ito (= G. lafaldense spinosissimum Hge.Jr.) and G. lafaldense roseiflorum Hort. are also quoted by Backeberg as names that have been given without clear definitions. In his Lexikon (1965) variety hossei is retained, as is the species G. albispinum, while the forma enorme of Oehme is mentioned as a possible variety, and forma evoluens of Oehme is also mentioned, so that it would appear that in the intervening years, the author had formed the opinion that these two at least were of some significance.

In his paper of 1963, Simon re-states the forms of Oehme with excellent illustrations of the plants vegetatively produced from Oehme's original imports, and grown on their own roots. The plants used to illustrate the original paper had been grown on in Europe as grafts and therefore it could be argued that they were not necessarily typical. Apart from expressing some doubt as to the reliability of the numbers of stigma lobes stated by Oehme, he accepts the existence of these forms and adds two more. The first, forma intermedium (Hort.) is thought to be transitional between f. deviatum and f. enorme, while the second is

G. lafaldense f. spinosissimum Haage Jr. ex Simon. This was referred to previously by Backeberg as "only a name", but Simon now provides a Latin diagnosis.

Putnam, in a private communication to the present author has mentioned a forma candida though as yet it does not seem to have appeared in the literature. Bayr (1967a) reports an almost pure white flowering plant amongst collected plants sent him by Markus & Rausch from the Sierra Chica, Córdoba which could possibly be the same kind of plant.

A yellow flowered form is said to exist and a small specimen reputed to be this type is in the present author's collection, but it is still very small and has not yet flowered. There is no record of collected material having this flower colour and it could well be a hybrid of greenhouse origin, or alternatively, wrongly identified material of Frailea pygmaea (vide supra).

Habitat material has been introduced into Europe under FR 441 by Ritter (1967b) as a result of his collecting during the years 1956-58 which Markus & Rausch, during 1965, also sent collected material to Europe under the number R 104, (1967b).

Regarding the nomenclature of the species, there seems to be little justification for retaining Vaupel's name, G. lafaldense, and the present author accepts G. bruchii (Speg.) Hosseus as valid. The various forms described for this species are recorded here but until such time as a detailed habitat study is possible, no great value should be placed upon them. The plant appears to grow at quite widely varying altitudes and under very rigorous climatic conditions (temperatures ranging from +40°C to -10°C for example) and some degree of variation in plant form is

(for example, in the description of the fruit with which Spegazzini was not familiar) but these additions are always supplementary to the original, and no parts of it have been altered or omitted.

Individual plant bodies are dull green, more or less spherical, somewhat flattened above and depressed at the growing point, the latter region being densely spined. The dimensions given by Spegazzini are 10 - 20 mm in diameter and the same in height. Vaupel (1924) says "small to medium size" while Backeberg (1959) quotes up to 30 mm for the height and as much as 60 mm in diameter, though these upper limits must surely be exceptional. Seedlings begin to branch profusely at an early age forming dense clumps or cushions 10 - 15 cm in diameter and containing between 10 - 30 heads. Individual branches have 8 - 12 (or more) ribs which are broken up into tubercles but these are seen only with difficulty due to the interlacing spines. The tubercles themselves are small, conical - hemispherical in shape and arranged in vertical rows. According to Backeberg, they lack "chins" but some examples seen appear to possess this feature though not strongly developed. The areoles are small, narrowly elliptical and bear white wool according to Backeberg's account. Radial spines would seem to vary from 12 - 17, though Backeberg quotes "about 10". Although usually white in colour, Backeberg records a tendency towards having brownish bases. They are recurved, appressed, slender, almost bristle-like, rough and papillate. Usually they are arranged with about 6 - 8 on either side of the areole, with 1 - 3 directed downwards at the bottom. They are almost cylindrical in

cross-section, 2 - 5 mm in length and 0.15 - 0.30 mm in diameter.

Spegazzini stated that centrals were not present in his plant but Vaupel describes them as "often missing", and Backeberg gives 0 - 3, whitish to brownish in colour.

The flowers appear on the edge of the central depression on each branch, solitary or few (1 - 3), bell-shaped, 15 - 20 mm in height and the same in diameter. Vaupel and Backeberg both give larger flowers, 30 mm and 35 - 50 mm respectively, but as Hosseus (1929b) points out, flower size is normally very variable and this apparent discrepancy is probably not significant. Both Spegazzini and Vaupel state the flowers to be scentless. However, the present author has observed G. bruchii to be one of the relatively few members of the genus where a fair proportion of individuals do possess a distinct scent. It varies somewhat in strength and its precise nature, and while the ability to detect delicate scents varies widely from person to person, never-the-less this fact has been confirmed by other observers in their own specimens of this plant.

When describing the pericarpel, Spegazzini states that it is very short, scattered with reddish-green linear scales, with a little tuft of hair and at times, a weak bristle in the axils. This is the only part of the description which does not fit G. bruchii or any other normal Gymnocalycium, and it was this that was responsible for Spegazzini placing his plant in the genus Frailea. Vaupel merely says that the pericarpel is sparsely scaled and Backeberg adds that the larger scales have an olive green centre.

The perianth segments are oblong lanceolate, generally with a small flexible point, about 25 in number, and measuring 2 - 4 mm in breadth.

They are pinkish-purple, with a darker violet mid-stripe. Vaupel describes them as acuminate 3 - 4 mm wide, and pink in colour, with a darker violet-pink mid-stripe. Backeberg agrees on the dimension, describes the colour as pale pink with somewhat purplish-pink mid-stripe, and adds spatulate to the variety of petal shapes. The stamens are adherent to the perianth tube and numerous (Backeberg), the filaments practically white, the anthers yellowish. The style is moderately robust, straight, yellowish in colour, and sufficiently long to raise the 5 - 8 yellowish stigma lobes just clear of the longest stamens. Vaupel says that the style is not longer than the stamens, and Hosseus (1929b) apparently not differentiating between style and stigma lobes, quotes this as a difference between the two descriptions whereas in actual fact there is no disagreement, especially as in this species, considering the size of the flower, the stigma lobes are relatively large. Even if the style is not quite as long as the upper stamens, the greater part of the stigma lobes projects above them. The fruit and seed, unknown to Spegazzini, is described by Hosseus (1929b). The fruit is spherical to elliptical and bright green in the unripe state but later becomes dark reddish brown and bursts open down one side. The seed is round, cut off straight at one side. Measuring 1.0 - 1.2 mm in diameter, it is characterised by its dull black - from some angles pale grey - colour and it is covered with small warts. He reports having found 17 - 22 mature seeds in the fruits examined.

It has been noted that some specimens at least are male sterile, there being no pollen formed in the otherwise fully formed anther sacs.

Whether or not this occurs in plants found in habitat is not known, but if so it could well account for the failure of specimen plants to produce fruits when just a few are kept together in cultivation. Spegazzini (1923) states "In spite of (the plant) having flowered several times in La Plata, it has not been possible to obtain fruits." Hosseus (1929b) also comments:- "In cultivation it is, by all accounts, very difficult to obtain fruits; the reason for this is unknown to me." No obviously female sterile plants have been noted by the present author to date, but out of six plants pollinated by hand during the current year, only two set seed. They were the only two male sterile plants. On the other hand, during two previous years, fruits were obtained on one plant which had fully functional stamens, thus ruling out the hypothesis that all flowers of this species are unisexual, a state of affairs closely approached by some of the related yellow-flowered *Gymnocalyciums* of Uruguay.

Description of Varieties:

1. G. bruchii var. hossei, Backeberg

This plant is said by the original author to differ from the type of the species by the larger flowers having looser, outstanding, slender, pointed petals which are more or less twisted at the ends. The ends of the petals are drawn out into a long point. The spines in the region of the growing point are also said to be flesh pink while central spines occasionally occur though only one per areole and they are often difficult to distinguish from the radials. A photograph of such a plant is published in Backeberg's *Die Cactaceae* (1959). Oehme (1941b) while claiming to base his G. lafaldense forma hossei (Backbg.) Oehme on the same plant, says of the flower only that it is 4.5 - 5.0 cm long and in diameter,

of quite a pale pink, the inner petals being almost white with a pale violet mid-stripe. The pericarpel is longer than the type, bluish-moss-green and with a waxy bloom, and loosely (?) scaled. The scales are pointed with a bright pink border. Oehme's usage of botanical terms seems a little unorthodox but it is assumed that the anthers and the five-lobed stigma are yellow while the filaments of the stamens and the style are white. The fruit is somewhat egg-shaped, bluish-moss-green and with a waxy bloom. The only point on which the accounts of both authors would appear to agree is that the plant has flesh pink spines in the region of the growing point. Simon (1973) tactfully describes the plant as follows:- "Body as in the type, offsetting from below, spines in the new growth slightly pink, later white with brownish base, flowers somewhat larger, 4.5 - 5.0 cm \emptyset with wavy tips, paler than the type."

2. G. bruchii var. enorme (Oehme) Backeberg

Although this was listed under G. bruchii as a variety by Backeberg in his Lexikon (1965), it was originally described by Oehme (1941b) as only a form of G. lafaldense. In his description Oehme states:- "Crown up to about 5 cm \emptyset . Spines shorter, stronger, glossy-white, ivory colour at the base. Occasionally a central spine is present. Flowers 5 - 5.5 cm long and in diameter, pink. The inner petals darker and broader, faintly shining. Outer petals with moss-greenish central stripe, the inner petals with a violet-red one. Pericarpel short, with strong flesh-coloured scales. Stamens and style ivory coloured. The style has eight stigma lobes which exceed the stamens in height. Fruit robust, about 1.5 cm, mossy-green in colour with waxy bloom, slightly glossy."

Backeberg (1965) merely mentions that large clumps are formed of individual heads of at least 5 cm in diameter and that one central spine is present per areole. Simon (1973) gives the diameter of individual heads as 5.5 cm, spines fewer than the type, 8 - 10, stronger and standing out from the plant body, glassy-white, yellowish white at the base. The areoles are definitely woolly. Flowers with broadly spatulate petals, lacking a central stripe. The latter statement directly contradicts Oehme and yet Simon's plants are supposed to be vegetatively propagated from those of the original author!

Description of Forms:

1. G. bruchii f. candida

At the moment this would appear to be a nomen nudum.

2. G. lafaldense f. deviatum Oehme

The original description by Oehme (1941b), reads as follows:-
 "Plant more robust, crown up to about 4 cm in diameter. Spines stronger, ivory-coloured, standing out from the plant body. Areoles larger with a more voluminous growth of ivory-coloured wool. Flowers more sturdy, 3.5 - 4.0 cm long and in diameter, pink, all petals with brownish green mid-stripe. The throat of the flower is of a deeper pink. Pericarpel short, stronger than in the type, dark brownish moss green. Scales more abundant, stronger, green with pale green border. Stamens and style ivory coloured, the style having seven stigma lobes. The style exceeds the stamens in height. Fruit small spherical, brownish moss green, with waxy bloom. Simon (1973) while omitting some of the above detail, adds that the plant is more squat and that a central spine is present.

3. G. lafaldense f. evolvens. Oehme

Oehme (1941b) describes it as having individual heads up to 5 cm in diameter. Central spines develop when an areole reaches the point of flowering. Radials up to 20 in number, centrals up to 3, all ivory coloured with light brown base. Flowers sturdy, 3.5 - 4.0 cm long and in diameter, robust, pink. Petals with brownish moss green mid-stripe, and running out into a point. Pericarpel sturdy, short, with large irregular, bright green bordered scales. Stigma lobes and style ivory-coloured. The style has 4 or 5 lobes and is exceeded in length by the stamens. Fruit short, about 1 cm, olive green, slightly shiny, splitting down one side and withering. Simon (1973) gives the size of individual heads as only 4 cm in diameter and states that the mid-stripe on the petals is not very pronounced.

4. G. lafaldense f. fraternum. Oehme

According to Oehme (1941b), individual plant bodies reach a size of 3.5 cm in diameter. There is a single central spine. All spines are a dingy ivory colour. (It should be noted here that on this one occasion, Oehme's Latin diagnosis does not coincide with the German description. The Latin reads:- "Areoles always bearing dingy ivory-coloured median spines." Simon (1973) is of no assistance in resolving this problem.) Flowers 3.5 - 4.0 cm in length and diameter. Petals pink, the inner ones with a darker mid-stripe, the outer ones having a mossy green one. Pericarpel small, spherical, completely bright green. Scales openly arranged, broad, with bright pink borders. Stigma lobes and style ivory coloured.

The style with its five lobes is longer than the stamens. Fruit small and spherical, bright green in colour. Flowers almost the same as for G. albispinum Backeberg. Simon (1973) merely adds that the petals are broadly spatulate.

5. G. lafaldense f. intermedium Hort.

This form is not mentioned by Oehme (1941b) but is included in the list given by Simon (1973). He claims that it is a transitional form between forma deviatum and forma enorme, with plant body size up to 5 cm in diameter. The spines are the same as in forma deviatum but without centrals. The flowers are 4 cm in diameter, pale pink in colour and lacking a distinct mid-stripe. There is no Latin diagnosis for this form and hence it is a nomen nudum.

6. G. lafaldense f. spinosissimum (Haage Jr) ex Simon 1973

Originally named by Haage Jr. but without Latin diagnosis, this form is validly described by Simon (1973). The body is said to be up to 15 cm high and 7 cm in diameter. There are up to 15 spines per areole, spreading laterally and 3 - 5 irregularly standing up in centre, up to 2 cm in length. Flowers up to 4.5 cm in diameter, pale pink, darker at the base and without central stripe.

7. G. lafaldense f. roseiflorum Hort.

According to Backeberg (1956) this is only a name and has not been validly described. It would seem likely that it represents a strain selected for in cultivation having a somewhat brighter pink flower colour. Generally speaking the flower colour in this group is rather insipid.

Habitat:

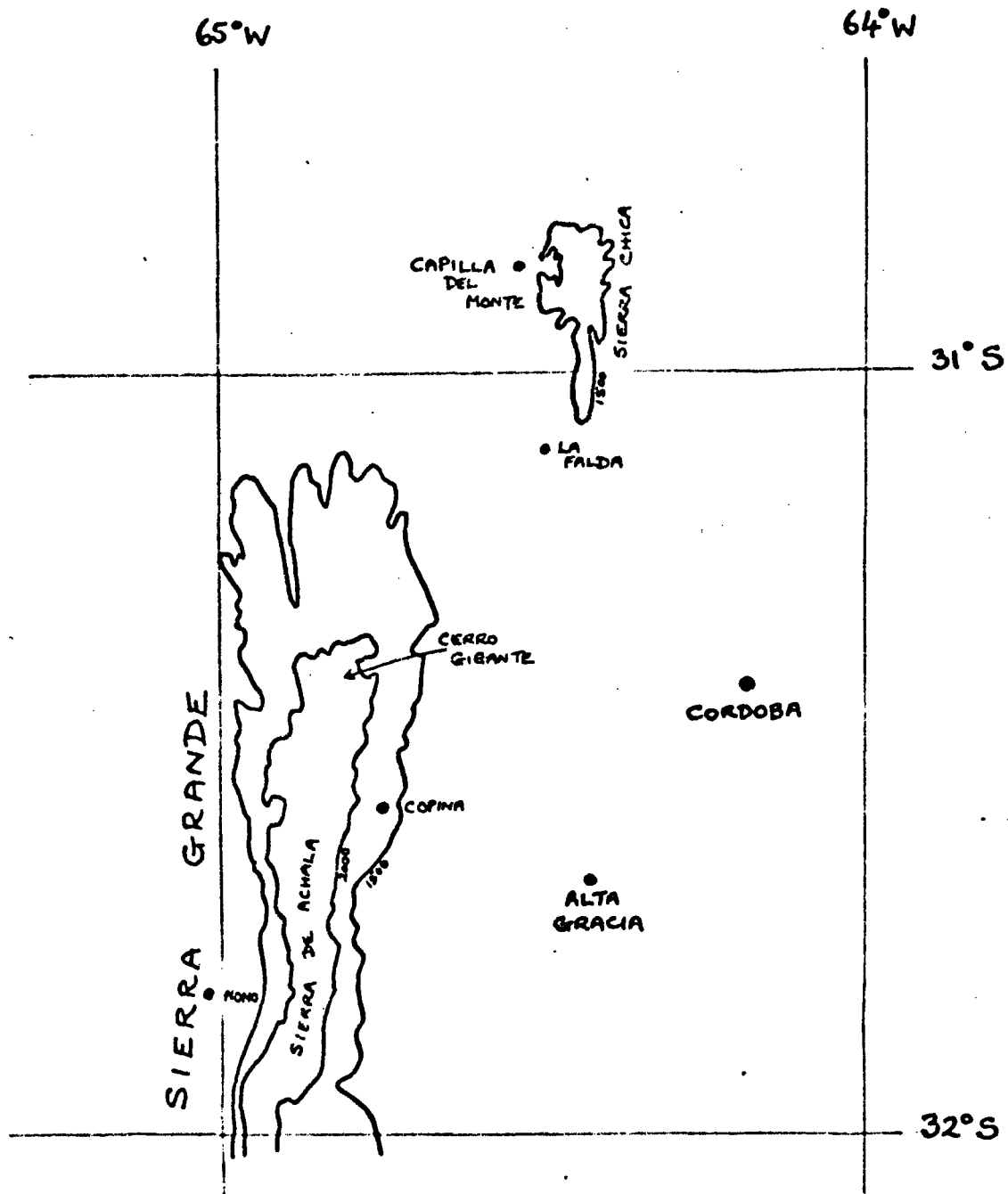
This plant occurs at an altitude varying between about 1000 m and 2000 m above sea-level. According to Osten (1941a) it occurred at La Falda on a dry sandy soil, stony and with scant vegetation, exposed to full sun and growing in crevices between rocks. The plants were difficult to find when not in bloom due to their resemblance to the surrounding rocks. Hosseus (1929b) agreed with Osten's description of the habitat except that the underlying rock was gneiss not granite, and he also stated that he himself had found it on granite on the Cerro Uritorco. In the Alta Gracia area, the plant was said by Hosseus to grow in long grass. In general, the plant seemed to prefer a humus rich soil between grasses, scattered rocks, and pebbles.

As is so often the case, precise details regarding localities are difficult to obtain. At the northern end of its distribution it occurs in the region of the Sierra Chica. Hosseus (1926) illustrates a plant from the military post of Loza in this area (unfortunately not shown on available maps) and again "at 1500 metres, Sierra Chica" (1929b). Rausch (1968) mentions merely "Sierra Chica" with no location or height. Hosseus (1929b, 1939) mentions the Cerro Uritorco near Capilla del Monte. This town is on the railway on the lower western slopes of the Sierra Chica, but the Cerro Uritorco has not been located. From this area specimens were collected at an altitude of between 1600 to 1850 metres. Rausch (1968) also mentions Capilla del Monte as being one of the habitats. On the same railway line but further south and still on the western flank of the Sierra Chica lies La Falda. Hosseus (1929b)

and Osten (1941a) both mention this locality as a source of the plant. Here it occurs on the lower slopes of the Sierra Chica at about 1000 metres, not at 1500 - 2500 metres as quoted by Vaupel (1924). The highest point of the whole range is only 1854 metres! Further south and somewhat further westwards Hosseus (1929b) records the plant from the Pampa de la Esquina near the Cerro los Gigantes at a height of between 1500 and 2000 metres. The Pampa has not been located but Cerro Gigante does appear on the map and has been assumed to be the mountains referred to. At the southern end of the habitat area, Spegazzini's original plant came from near Alta Gracia, almost due south of the Pampa de la Esquina. Hosseus (1929b) maintains that the area is a spur of the Sierra Grande with a maximum height of 1500 metres. This spur is not obvious on the map in use but the nearest land of that height to Alta Gracia occurs very close to Copina, on the eastern edge of the Sierra de Achala (part of the Sierra Grande), a town from which Buining (1972) also records the plant, occurring at a height of 1800 metres. Hosseus (1926) also collected material in the Sierra de Achala at 2000 metres above sea-level.

Map references:

LOZA (SIERRA CHICA)	64°27'W	30°53'S
CERRO URITORCO (CAPILLA DEL MONTE)	64°32'W	30°52'S
LA FALDA	64°30'W	31°06'S
PAMPA DE LA ESQUINA (CERRO GIGANTE)	64°46'W	31°24'S
COPINA	64°45'W	31°34'S
SIERRA DE ACHALA	64°52'W	31°48'S
ALTA GRACIA	64°25'W	31°40'S



Part of the Province of Córdoba, N. Argentina.

Distribution of G. BRUCHII.

(Scale: 1" = 16 miles.)

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GYMNOCALYCIUM ALBISPINUM Backeberg & Knuth

Backeberg & Knuth: "Kaktus ABC", pp.285, 416. 1935.

Synonymy:

GYMNOCALYCIUM LAFALDENSE Vaupel, forma ALBISPINUM Oehme.
Oehme, Cactaceae, Jahrbucher der D.K.G.,
Erster Teil, p.30. 1941.

Diagnosis:

Globosum saepe proliferans, opaca-viride, vertice lanosum et setis intricatis obtectum, costis 14, ca. 3 mm altis, 4 mm latis, supra areolas transverse incisus, areolis fere in incisuris immersis, rotundis saepe 1 mm inter se remotis, primum dense albo-tomentosis; aculeis setaceis ca. 25, albis, ad 10 cm longis, lateraliter intertextis, centralibus basi brunnescentibus, divaricatis; flore roseo-lilacino, rotato, ca. 3 cm lato, fructu oblongo-globoso. (Backeberg 1935).

Note: A completely different plant is frequently offered in the trade under this name. It is G. quehlianum variety albispinum and belongs to the Trichomosemineae group which is outside the scope of the present treatment.

Gymnocalycium albispinum was first described by Backeberg & Knuth (1935). At that time, the only other plant in the genus at all similar was G. bruchii, and although a variable plant, the descriptions and illustrations given by Spegazzini (1923) and Vaupel (1924) (as G. lafaldense) could, with some degree of justification be said to differ from the plant in question. In the original description of G. albispinum no habitat details other than "Cordoba, Argentina" were given but at least one may infer that the original material was habitat collected. It should be noted that G. bruchii

also comes from the same general area. In later years the degree of variability within G. bruchii was more fully realised and this resulted in Oehme (1941) publishing a study of the species and his setting up of a number of forms, amongst which, however, he included Backeberg & Knuth's G. albispinum. Considering the range of plants then available, it seems not an unreasonable action to take. In his *Die Cactaceae*, Backeberg (1959) retains G. albispinum as a full species, though the reasons given are not very convincing. He does concede, however, that the rank of variety under G. bruchii might possibly be appropriate but nevertheless does not make the new combination either there or later in his *Lexikon* (1965). In the present treatment of the genus it will be retained as a species for the present.

Description:

The following description is based on the original by Backeberg & Knuth (1935) supplemented from Oehme (1941) (who was working on material from Backeberg), and from Backeberg (1959). The original description has been in no way modified.

The plant body is small, spherical to elongated in shape and readily proliferating. The apex of each individual head is woolly and covered by interwoven bristles. The body colour is dull green. The ribs number about 14 and are approximately 3 mm high and 4 mm broad. They are broken up into tubercles by transverse incisions immediately above the areoles. The areoles are circular, often separated by as little as 1 mm, almost embedded in the transverse incisions, and at first possess dense white wool. The radial spines number about 25,

are bristle-like and measure 10 mm in length. They are white and interwoven laterally one with another. There are several central spines (3 - 5 according to Oehme) which develop one after another, white in colour with a brownish base. They are not easily distinguished from the radials, spreading out at a wide angle. The flowers are rotate, up to 3 cm in diameter (up to 3.5 cm according to Oehme). They are pale lilac-rose in colour and Oehme describes the inner petals as having a darker mid-stripe while the outer ones have a brownish mid-stripe. Oehme also states that the filaments of the stamens and the style are ivory-coloured. The fruit is elongated-spherical and the seeds similar to those of G. bruchii, that is, Backeberg Seed type 4.

Habitat:

There seems to be no accurate record of the source of these plants but Northern Argentina, probably in the region of Cordoba is given by Backeberg (1959). For map, see under G. bruchii.

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Group I

1. G. fleischerianum
2. G. megalothelos
3. G. paraguayense

The justification for this group is largely geographical.

G. fleischerianum is relatively well known, there being a considerable quantity of imported material in cultivation in Europe at present. G. paraguayense has recently been re-discovered but material is very limited so far. G. megalothelos is another problem plant which seems never to have been re-collected in habitat and may eventually prove to be outside the confines of the group under discussion but for the moment it may be conveniently placed here.

GYMNOCALYCIUM FLEISCHERIANUM Backeberg

Backeberg: Die Cactaceae, Volume 3, p.1703. 1959

Synonymy:

ECHINOCACTUS DENUDATUS var. ANISITSII Hort.

Haage & Schmidt 1912. In Pazout, Kakteen und andere Sukkulente, Volume 14, No.7, p.135. 1963.

GYMNOCALYCIUM DENUDATUM var. ANISITSII Hort.

Frič - Liste, 1929.

GYMNOCALYCIUM DENUDATUM var. ANISITSII Jajó, Kaktusár, 1934.

GYMNOCALYCIUM FLEISCHERIANUM Jajó, 1934. nom.nud.

GYMNOCALYCIUM DENUDATUM var. ANISITSII Hort.

Kreuzinger, Verzeichnis, p.13. 1935.

GYMNOCALYCIUM FLEISCHERIANUM Jajó. In Kaktus ABC, p.288. 1935.

GYMNOCALYCIUM FLEISCHERIANUM Jajó. In Y. Ito, Explanatory

Diagrams of Austroechinocactanae, p.171. 1957.

Diagnosis:

Globosum, ad 10 cm latum, nonnunquam proliferans, ad 6 - 7 cm altum; costis ad 8, ad 2.5 cm latis; areolis rotundis, ca. 5 mm diam; aculeis ad 20, ad ca. 2.5 cm longis, flavidis, [†] curvatis, centralibus vix distinctis, elasticis; flore infundibuliformi, ad 3.5 cm diam; 4 cm longo, albo, roseistomo. (Backeberg 1959).

Varieties:

1. var. ANDERSOHNIANUM (Haage Jr.) Schütz, Fričiana, Radač, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. ANDERSOHNIANA Haage Jr.,

Monatsschrift für Kakteenkunde,
p.36. 1898.

Synonyms (cont..)

GYMNOCALYCIUM DENUDATUM var. ANDERSOHNIANUM Y. Ito,

Explanatory Diagrams of Austroechinocactanae,
1957.

First description:

Rippen sieben, ziemlich stark, gleichförmig verlaufend, nicht durch Querfurchen gegliedert; Areolen mit geringem Wollfilz bekleidet. Randstacheln fünf bis sieben, spreizend, nadelförmig, gerade; im Neutrieb hellbraun, ins Graue, Mittelstacheln einzeln. Körper säulenförmig, oben verbreitert, bis 2⁴ cm hoch. (Haage Jr. 1898).

2. var. HEUSCHKELIANUM (Haage Jr.) Schütz. Fričiana, Rada 6, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. HEUSCHKELIANA Haage Jr. Monatsschrift für Kakteenkunde, p.36. 1898.

GYMNOCALYCIUM DENUDATUM var. HEUSCHKELIANUM Y. Ito. Explanatory Diagrams of Austroechinocactanae. 1957.

First description:

Rippen sechs, stark, nicht durch Querfurchen gegliedert, aber die Areolen eingesenkt, mit ziemlich reichlichem Wollfilz versehen. Stacheln sieben, horizontal strahlend, nach unten gekrümmt, an den Körper gedrückt. Körper ziemlich hoch. (Haage Jr. 1898).

3. var. MEIKLEJOHNIANUM (Haage Jr) Schütz. Fričiana, Rada 6, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. MEIKLEJOHNIANA Haage Jr. Monatsschrift für Kakteenkunde, p.36, 1898.

GYMNOCALYCIUM DENUDATUM var. MEIKLEJOHNIANUM, Y. Ito. Explanatory Diagrams of Austroechinocactanae, 1957.

3. Cont...

First description:

Rippen sieben, stark, nicht durch Querfurchen gegliedert, aber Areolen etwas eingesenkt; mit reichlichem Wollfilz versehen. Randstacheln fünf, gekrümmt, abstehend, stark zusammengedrückt; im Neutrieb hellbraun, dann hornfarbig oder schwarz. Körper kugelförmig. (Haage Jr. 1898).

This plant, named after Zdenek Fleischer, a cactus grower from Brunn, Czechoslovakia, was first described by Jajó (1934) and later by Backeberg (1936) but on both occasions without a Latin diagnosis. Backeberg (1959) states that he produced a diagnosis to remedy this in 1938 but it seems not to have been published. He therefore includes a diagnosis on this occasion but does not make it clear whether he copied the description of Jajó or compiled it afresh from his own ideas of what the plant looked like. Unfortunately the original Jajó article has not yet come to hand so that a comparison of the descriptions is not yet possible. In either case, the valid name would appear to be G. fleischerianum Backeberg 1959. A photographic illustration of the flower by Andreae was published in *Kakteenkunde* 43, 1939, while some excellent habitat photographs, taken by A. M. Friedrich, have been published in recent years (1970a).

Jajó (1934) himself referred to the same plant as G. denudatum var. anisitsii, but it was listed by Y. Ito (1957) as G. fleischerianum Jajó 1934. Backeberg & Knuth (1935a) mention it without description and quote Jajó as author. The name G. denudatum var. anisitsii Hort. was used by Kreuzinger (1935b), presumably a name from Haage & Schmidt (1912)

or from Frič (1929), but here again, the originals of these last two references are not available.

No mention has been made of G. denudatum var. paraguayense (Haage Jr) Y. Ito, in the above summary. Backeberg considers this to be synonymous with G. fleischerianum but because of the discovery of a valid description of E. paraguayensis Schumann 1903 by Schütz (1966) and the subsequent discovery of plants in habitat reported by Moser (1972), this can now be discounted. (See under G. paraguayense).

It has been suggested by Moser, that G. megalothelos may also belong here as a synonym but although apparently coming from Paraguay, this admittedly poorly known plant has been said to have white or pink-tinged flowers but a red throat to the flower does not seem to have been recorded for it, and synonymy with G. fleischerianum should be discounted. On the other hand, this should not rule out a close relationship between the two plants.

Putnam (1969) suggests that G. stuckertii Frič (non Speg.) might also be yet another synonym for G. fleischerianum but this too can be disregarded as the literature indicates clearly (see under G. stuckertii) that this plant was a member of the Muscosemineae whereas G. fleischerianum is most definitely not.

As a result of his recent studies, Schütz (1966) has transferred three of Haage's original E. denudatus varieties to be varieties of G. fleischerianum. They are var. andersohnianum, var. heuschkelianum, and var. meiklejohnianum. While it is virtually impossible to demonstrate conclusively at this late date and in the absence of any detailed descriptions, that this transfer is in fact correct, it certainly seems a reasonable supposition and should be accepted.

According to Frič, (1970b) writing in 1937, plants which he refers to as "local hybrid forms of G. denudatum" were imported into Europe in large quantities by Haage Jr. The date of this importation is not stated but it must have been after 1885 as they were collected in Paraguay by Herman Grosse, who in that year took up residence in Paraguari, Paraguay and began a long period of cactus collecting, sending both live and preserved material to Prof. Karl Schumann during the preparation of his Monograph on the Cactaceae published in 1889, and to various other collectors and nurserymen. Today, these plants (or their descendants) seem very largely to have disappeared from collections (See however, photographs in Schütz, 1966), but at the time, Haage Jr. described 8 varieties from amongst them. Three, at least, of these varieties (1966) are now thought to represent what we now know as G. fleischerianum. Frič recalls how, in 1925, he visited the location near Paraguari with which he was familiar from a previous expedition (probably in the year 1903) and where he had found G. denudatum in great quantity. According to his account, conditions had changed in the meantime, and the former grassland had become much wetter and overgrown with trees and very few examples of G. denudatum were found. On the other hand, he found large numbers of "the already well-known hybrids (in another translation the word variety appears instead of hybrid) known under the name G. denudatum anisitsii", (i.e. G. fleischerianum).

It is not clear why Frič should assume the plants he found to be hybrids. Even if he used the word variety, why should he think G. denudatum was involved for any other reason than a superficial bodily resemblance in some, but by no means all, cases? As one considers the problem further, one begins to wonder whether in fact G. denudatum is involved at all.

The most north-westerly area from which G. denudatum is recorded is the Misiones province of Argentina, and even this is doubtful. Spegazzini (1905) says that "my own specimens look very much like variety heusckelianum Haage Jr." and as this is now considered to be a variety of G. fleischerianum, his record of finding G. denudatum in Misiones is unreliable. The proper habitat of G. denudatum is probably over 600 Km to the south-east of Frič's locality at Paraguari.

When Frič recorded G. denudatum from Paraguay in 1903 or thereabouts, he may well have been going merely on the resemblance of the plant body to that of the G. denudatum already known, and one is forced to consider the alternative possibility, namely that here was a plant with features in common with G. denudatum but not a hybrid or a variety of it. That such groups of plants having common features with G. denudatum exist is well illustrated by Moser (1972), where figs. 7 & 14 illustrate collected plants from Frič's locality bearing a marked resemblance in vegetative features to the genuine G. denudatum, but are in fact forms of G. fleischerianum according to A. M. Friedrich, the collector. Another example is the recent discovery of G. horstii, another species from Brazil, which superficially is very similar in plant body to G. denudatum.

Further evidence indicating a mistake in identification by Frič is provided by Frič himself. He states in his letter to Buining in 1937 (1970b) that "It is well-known that the Denudatus group differs from other Gymnocalyciums in that the fruit, when ripe, does not split down its length but softens at the base and dissolves away." One wonders whether this feature may be characteristic of G. fleischerianum. If so, it would be most useful in defining the species. Moser (1970a) does indeed confirm that all the fruits of G. fleischerianum and its forms

(as he understands them) have such fruits. As far as the present author is aware, G. denudatum fruits do not behave in this manner and G. horstii most certainly does not. This would indicate that Frič in 1937 did not see any genuine G. denudatum fruits at all, only those of G. fleischerianum. This would reveal his statement regarding the disappearance of G. denudatum in habitat, in a very different light, though in fairness it must be pointed out that over 20 years had elapsed between his two visits.

Frič's description implies that he was referring to a very varied, though closely related group of plants. Friedrich's account (1970a) likewise emphasises the variation found in habitat over a very restricted area. He states that "all the plants of this species (G. fleischerianum) come from the Pirareta area. I visited a rather outlying spot in this region, and growing there were so many beautiful and distinctive forms, that anyone who had not, with his own eyes, seen them all within a radius of a few hundred metres, would certainly have considered them different species, or different varieties." He continued: "Some of these plants had quite a dense spination, the spines lying close to the plant body and covering it like a spider's web, while others had rigid projecting spines almost like those of G. pflanzii; still others, in contrast, were almost spineless, these latter forms growing more in the shelter of bushes. I would assume that the variation in epidermis from dull to glossy depends on the extent to which these plants are saturated with water."

Moser (1970a) supports the argument for it being a very variable species by means of numerous excellent photographs. After careful study of the plants illustrated, however, two at least would appear to be quite different in habit and outside the G. fleischerianum group

altogether, but the remainder are indeed an extremely varied assortment.

Friedrich was also present when in 1968 Buining & Horst collected G. fleischerianum once again. It was in the vicinity of a waterfall near Colonia Pirareta, Paraguay. Although the precise locality is not given, this place is in the same general area as Paraguari. The plants occurred in an open area amongst dense thickets, some growing in damp sandy parts and thickly covered with moss, and others in rocky areas. The spination was said to vary with the immediate surroundings of the plants but the variation was not specified. There is no mention of any plant resembling G. denudatum being found on this occasion. Material obtained was placed under the collection number HU 304.

Quite apart from the body form, Moser (1970a) mentions the variation in such features as petal shape, the colour of the throat and the colour and texture of the epidermis, the latter varying from glossy green to dull dark green. The plants may be single or may off-set from the base or the areoles, producing in some cases, up to 20 heads. The spine count also varies between 2 and 20 per areole; spine colour from yellowish-white to almost black. Single plants may attain the size of 10 cm in height and 17 cm in diameter. They are obviously semi-shade plants from the description of their habitat and this is borne out in practice, for full summer sun in Europe often causes plants to become tinged with red and growth ceases. Recovery is usually very slow, if it occurs at all.

One very striking feature of the habitat seems to be the wetness of it. Moser (1970a) states that this species "often stands for weeks on end, virtually under water and, later on, if plants are dug up, water immediately collects in the resulting cavities." Buining (1970b)

mentions some plants being covered in moss, and Frič also mentions the general dampness of the habitat.

Description:

The following description is based only on the Latin diagnosis and German comments of Backeberg (1959, 1965). However, it should be realised that with such a variable species, individual specimens may not necessarily fit the description in its entirety.

Plant body globular to elongate, up to 10 cm in diameter and up to 6 or 7 cm in height, sometimes proliferating. Body light glossy green, with depressed growing point. Ribs rounded, up to 8 in number, reaching 2.5 cm in width on older plants. Tubercles not sharply defined. Areoles round, about 5 mm in diameter, with thick brownish-white wool. Spines about 20 in number, up to about 2.5 cm long, yellowish white and brown, later becoming grey, spreading, somewhat flexible, centrals difficult to differentiate. Flowers funnel shaped, up to 3.5 cm in diameter and 4.0 cm in height, white with a brilliant pink throat.

Description of varieties:

1. var. andersohnianum

Six or seven ribs, moderately stout, uniformly developed, not divided by cross-furrows; areoles bearing sparse wool-felt.

Radial spines five to seven, spreading, needle-shaped, straight; on new growth pale brown, becoming grey later. Central spines 1. Body columnar, broader above, up to 2⁴ cm high.

2. var. heuschkelianum

Ribs six, stout, not broken up into tubercles by cross-furrows, but the areoles are sunken bearing moderately plentiful wool-felt.

2. Cont...

Spines seven, spreading horizontally, curved downwards, appressed to the plant body. Body moderately high.

3. var. meiklejohnianum

Ribs seven, stout, not broken up by cross-furrows, but areoles somewhat sunken, bearing abundant wool-felt. Radials five, curved, out-standing, strongly depressed; at first pale brown, then horn coloured or black. Body spherical.

All the above descriptions are the originals by Haage Jr. In *Monatsschrift für Kakteenkunde*, Volume 8, p.36. 1898.

Habitat:

Friedrich (1970a) states that all specimens of G. fleischerianum forms come from the Pirareta area of Paraguay, and it was here, near a waterfall, that Buining & Horst (1970b) collected their plants. A specimen photographed in habitat by Friedrich and said to be the variety heuschkelianum is illustrated by Schütz (1966) and came from near Piribebuy. Frič quotes the vicinity of Paraguarí as the habitat but this town is only about 18 Km from Piribebuy. In spite of Friedrich's statement above, it should be borne in mind that Spegazzini (1905) thought that his specimens of G. denudatum, presumably from Misiones, Argentina, looked similar to variety heuschkelianum, so that there is a possibility that the distribution of G. fleischerianum may be wider than is at present thought.

Map references:

PIRARETA	56°57'W	25°27'S
PIRIBEBUY	57°02'W	25°27'S
PARAGUARÍ	57°08'W	25°36'S

Sheet: G21 - ASUNCION

Note: For sketch map, see under G. paraguayense

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- 1935a BACKEBERG, C. & KNUTH, F. M., Kaktus ABC, p.288.
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- 1963 PAZOUT, F., Kakteen und andere Sukkulente, Volume 14, No.7, p.135.
- 1965a SCHÜTZ, B., Fričiana Rada 5, C30, p.31.
- 1965b BACKEBERG, C., Kakteenlexikon, p.167.
- 1966 SCHÜTZ, B., Fričiana Rada 6, C40.
- 1969 PUTNAM, E. W., Synonymy of the genus Gymnocalycium.
- 1970a MOSER, G., National Cactus & Succulent Journal, Volume 25, No.2, p.34.
- 1970b BUINING, A.F.H., Succulenta, Volume 49, No.5.
- 1972 MOSER, G., Fričiana Rada 8, C47

GYMNOCALYCIUM PARAGUAYENSE (K. Schumann) Schütz

Schütz: Frićiana, Rada 6, C40. 1966.

Synonymy:

- ECHINOCACTUS PARAGUAYENSIS Schumann, Plantae Hasslerianae
In the Bulletin de L'Herbier Boissier,
Volume 3, Second Series, p.252. 1903.
- ECHINOCACTUS DENUDATUS var. GOLZIANA Mundt, Monatsschrift für
Kakteenkunde, Volume 7, p.187. 1897.
- ECHINOCACTUS DENUDATUS var. BRUNNOWIANA Haage Jr. Monatsschrift für
Kakteenkunde, Volume 8, p.37. 1898.
- ECHINOCACTUS DENUDATUS var. PARAGUAYENSIS* Haage Jr. or Mundt?
nomen nudum.
- GYMNOCALYCIUM DENUDATUM var. GOLZIANUM Y. Ito, Explanatory Diagrams
of Austroechinocactanae, p.170. 1957.
- GYMNOCALYCIUM DENUDATUM var. BRUNNOWIANUM Y. Ito, Explanatory Diagrams
of Austroechinocactanae, p.170. 1957.
- GYMNOCALYCIUM DENUDATUM var. PARAGUAYENSE Y. Ito, nomen nudum. 1954.

Note:

Britton and Rose (1922) mention "variety bruennowii" under G. denudatum as one of a number of varieties with which they are not familiar, and they give Schelle (1907) as the source of the name. Reference to this latter author shows that Haage Jr. is clearly stated as the author of the original description and the plant is also illustrated. For some obscure reason however, Britton & Rose also give the same plant (admittedly rendered as "variety bruennowianus" as a synonym of G. damsii, a plant of a different seed group completely and outside the scope of the present work.

* Regarding this rather doubtful name, see comments following under the general discussion of the species.

Diagnosis:

Petalis albis basi interna purpureis. (Schumann 1903).

In addition, Schumann states: "Je crois maintenant que cette plante est une bonne espèce, qui se distingue de l'Echinocactus denudatus par le nombre des côtes aiguës, les aiguillons et la couleur des fleurs."

Varieties:

1. G. PARAGUAYENSE var. WIEDITZIANUM (Haage Jr.) Schütz. Fričiana, Rada 6, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. WEIDITZIANA Haage Jr., Monatsschrift für Kakteenkunde, Vol.8, p.36, 1898.

GYMNOCALYCIUM DENUDATUM var. WEIDITZIANUM Y. Ito, Explanatory Diagrams of Austroechinocactanae, p.170. 1957.

First description:

Rippen sieben, besonders unten dick, zwischen den Areolen mit einer Querfurche versehen; Areolen mit sehr geringem Wollfilz bekleidet, etwas eingesenkt. Bestachelung sehr gering; meist sind ein bis drei angedrückte, braune, runde Stacheln vorhanden. (Haage Jr. 1898).

2. G. PARAGUAYENSE var. WAGNERIANUM (Haage Jr.) Schütz. Fričiana, Rada 6, C40. 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. WAGNERIANA Haage Jr. Monatsschrift für Kakteenkunde, Vol.8, p.37. 1898.

GYMNOCALYCIUM DENUDATUM var. WAGNERIANUM Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.170.1957.

First description:

Rippen sechs, später aber mehr, mit sehr schwachen Querfurchen versehen, unter den Areolen nicht kinnförmig vorgezogen. Areolen mit reichlichem Wollfilz bekleidet. Randstacheln nur zwei bis drei, verhältnismässig plump, rund, dunkelbraun, etwas gekrümmt, bis 2 cm lang; im Neutrieb hellbraun, dann dunkelhornfarbig. Körper ziemlich kurz. (Haage Jr. 1898).

3. G. PARAGUAYENSE var. SCHEIDELIANUM (Haage Jr.) Schütz. Fričiana, Rada 6, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. SCHEIDELIANA Haage Jr. Monatsschrift für Kakteenkunde, Vol.8, p.37. 1898.

GYMNOCALYCIUM DENUDATUM var. SCHEIDELIANUM Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.170. 1957.

First description:

Rippen zehn, verhältnismässig schmal und scharf; Areolen mit mässigem Wollfilz bekleidet, sehr viel enger gestellt als am Typus, zwischen ihnen seichte Furchen, über denen die Rippen kurz kinnförmig vorgezogen sind. Randstacheln fünf, strahlend, nicht angedrückt, hellbraun, dann grau. Körper höher, kurz säulenförmig. (Haage Jr. 1898).

4. G. PARAGUAYENSE var. ROSEIFLORUM (Hildmann) Schütz. Fričiana, Rada 6, C40, 1966.

Synonyms:

ECHINOCACTUS DENUDATUS var. ROSEIFLORUS Hildmann, In Schumann Gesamtbeschreibung der Kakteen, p.414, 1898.

GYMNOCALYCIUM DENUDATUM var. ROSEIFLORUM Y. Ito. Explanatory Diagrams of Austroechinocactanae, p.170. 1957.

First description:

Blüten mit krausen, inneren Hüllblättern, die aussen resenrot überlaufen sind. (Schumann 1898).

5. ECHINOCACTUS DENUDATUS var. PARAGUAYENSIS FULVISPINUS Mundt. In Schelle, Handbuch der Kakteenkultur, p.190. 1907.

Synonym:

E. DENUDATUS var. FULVISPINUS Mundt. In Backeberg. Die Cactaceae, Volume 3, p.1703. 1959.

6. ECHINOCACTUS DENUDATUS var. PARAGUAYENSIS NIGRISPINUS (No author) In Schelle, Handbuch der Kakteenkultur, p.190. 1907.

Synonym:

E. DENUDATUS var. NIGRISPINUS Hort. In Backeberg, Die Cactaceae, Volume 3, p.1703. 1959.

Note:

Nos. 5. and 6. lack descriptions at present, and are thus not placed in the genus Gymnocalycium.

This plant was first listed as a full species by Schumann (1903) after a study of plants collected at some time between 1885 and 1902 in Paraguay. "I believe now" he writes "that this plant is a valid species, that is distinguished from E. denudatus by the number of the angular ribs, the spines, and the colour of the flowers." He gave as a synonym E. denudatus Lk. & Otto, variety paraguayensis Mundt. Investigation of the reference (1897a) he gives for this varietal name yields only the report of the Nomenclatural Commission of the German Cactus Society. No varietal names are mentioned but the following phrase occurs "... a valid variety for which the name given by Herr Mundt should be retained." Only a month later, Mundt (1897b)

declared his intention of naming the plant, which he had received from Paraguay in January 1897, and which was referred to by the Commission, after Herr Golz. It seems very strange that Schumann, writing in 1903, should indicate the indirect reference to the plant in the November issue of *Monatsschrift für Kakteenkunde* 1897, and fail to realise that it had been named E. denudatus var. golziana Mundt, in the very next monthly issue of the same journal. On the other hand, what little description we have is, admittedly, contained in the first of the two publications.

There seem to be two possible explanations to the situation:-

1. There might be an error in the reference given by Schumann and the variety might exist and be described elsewhere, or
2. Mundt had previously referred to this plant as "variety paraguayensis" pending the decision of the Commission (which took four months to produce their findings) and amongst his collector friends the name persisted in spite of his subsequent renaming of it, and it is possible that Haage Jr. may also have been partly responsible by marketing commercially, so-called E. denudatus variety paraguayensis plants prior to the official naming of the plant. This could well have happened then as indeed, regrettably, it still sometimes happens today. This may well have induced a slip of the pen by Schumann when writing about it.

Regarding the first possibility, the first mention of E. denudatus variety paraguayensis Mundt in M.f.K. seems to be a passing reference to the plant in an account of a visit by members of the German Cactus Society to a collection recorded in Volume 8, p.133, 1898. but no description was given. Schelle (1907) lists E. denudatus var. paraguayensis forma fulvispinus Mundt,

but once again a description is lacking. In any case, both these references post-date that of Schumann, so that the first possibility seems unlikely.

If the second possibility is the correct one, then variety golziana Mundt is the same plant as that described by Schumann as "var. paraguayensis Mundt." While this could seem a reasonable assumption under the circumstances, it should be noted that E. denudatus var. paraguayensis Haage Jr. (non Mundt) could well represent another kind of plant altogether, at least in more recent years. The illustration given by Moser (1972) which dates from 1928, seems to resemble closely what is now understood by G. paraguayense but much earlier than this, the plant shown by Schelle (1907) was already something different. Present day plants bearing this name also on occasion vary very much from the original conception of it but this is not surprising as once again, there seems to be no valid description of the plant to which the name E. denudatus var. paraguayensis Haage Jr. should be applied.

Schütz (1966) has worked extensively on this problem and it is thanks to him that Schumann's description of E. paraguayensis of 1903 was re-discovered. Prior to this both Britton & Rose (1922) (at least by implication) and Backeberg (1959) had stated that the plant had never been described. Schütz, as a result of his studies, presumed the second of the two possibilities discussed above to be the correct one and in the absence of any further evidence coming to light in the literature, it certainly seems the most likely.

Consequently, it is here assumed that the plant received from Paraguay by Mundt in January 1897 and later named by him E. denudatus

var. golziana is a synonym of E. paraguayensis Schumann 1903. It could well be that Schumann's material in fact came from the same source at the same time. The collection number of the type material, No.6693, is quoted by Schumann and in the light of the recently reported re-discovery of the plant in habitat, it seems highly desirable that a check on it be carried out, if indeed it still survives in the Boissier Herbarium. No record of this having been done has come to hand.

Description:

In spite of the recent interest in this plant resulting from its re-discovery in habitat, and although illustrations are featured by Schütz (1966) and Moser (1972), no detailed botanical description of G. paraguayense has been published so far. The fragmentary description which follows is all that can be gleaned from the literature to date.

In the report of the Nomenclature Commission of the German Cactus Society (1897), the ribs of this plant are said to be higher than those of G. denudatum and moderately sharply angled. The spines are bright (?) curved, and spreading, not appressed. They are rigid, somewhat bent and darker than in G. denudatum. The brief diagnosis by Schumann (1903) states only that the flower petals are white, purple at the base internally, but a note following it adds that it may be distinguished from G. denudatum by the number of the ribs which are angular, the spines, and the colour of the flowers. Schütz (1966) records that the seedlings of G. paraguayense are easily distinguished from G. denudatum in that they have a different body colour, ribs which are angular, and broken up by cross-furrows and lacking the spider-like spines of G. denudatum. The areolar wool is said to be white, not yellow and the

areoles soon become bare. In mature plants, the buds are reddish brown while those of G. denudatum are greenish. The seeds are said to be smaller and easily distinguished from those of G. denudatum. Moser (1972) confirms the smaller seed size and adds that it is also very different from that of G. fleischerianum which also occurs in Paraguay, in an adjacent area or even possibly within the same area. The flower shape and colour are also said to be distinct.

Descriptions of varieties:

A number of so-called varieties of G. denudatum have been re-allocated by Schütz (1966) to G. paraguayense. None of them seem to be particularly well described and some appear to lack any description at all. Consequently the identities of these plants are open to some degree of doubt, as is also their relationship to G. paraguayense. However, as a result of the careful survey of old literature and catalogues of the period carried out by Schütz (1966) and considering the probable country of origin, it seems very likely that they belong here rather than with G. denudatum.

1. G. paraguayense var. weiditzianum

Seven ribs, particularly big at the base, having cross-furrows separating the areoles, which are somewhat sunken and which bear only scanty wool-felt. Spination very sparse, usually consisting of 1 - 3 brown appressed spines per areole. The spines are circular in cross-section.

2. G. paraguayense var. wagnerianum

Rib number at first six, later somewhat more. The tubercles are separated by very shallow cross-furrows and are not drawn out into chin-like structures beneath the areoles, which themselves have

copious quantities of wool-felt. Radial spines number 2 or 3, comparatively robust, round in cross-section, dark brown, and somewhat curved. They may be up to 2 cm in length, and are at first pale brown, later becoming dark horn-coloured. The plant body is moderately squat.

3. G. paraguayense var scheidelianum

Plants with ten ribs, relatively small and sharply angled. The areoles have a moderate amount of wool-felt and are much more closely arranged than in the type. Between the tubercles are shallow grooves above which the ribs are drawn out into short chin-like projections. There are five radial spines, spreading, not appressed, which are at first pale brown but later become grey. Body short columnar in form.

These first three descriptions are all taken from the original descriptions by Haage Jr. (1898a). In Haage's article, no mention of the flowers is made, but in a very crude translation or re-write of the article published in England (1898b), they are said to be $2\frac{1}{2}$ - 3" in diameter, borne on long stalks from around the top of the plant and to be white with a rose-pink centre.

4. G. paraguayense var. roseiflorum

Schumann (1898) briefly mentions this plant, describing the inner perianth segments as being curled or twisted and the outer ones as being entirely rose pink. Borg (1951) merely states inner petals pink, while Backeberg (1959) records "twisted petals tinged with red." Schütz (1966) maintains that it has the habit of G. paraguayense, the flower colour being deep pink with a darker red throat.

The above varieties are the only ones mentioned by Schütz (1966) but several others appear in the literature and presumably belong here under G. paraguayense, and they are listed for the sake of completeness, but it is most doubtful whether they do in fact exist today in cultivation, or even in habitat. No descriptions have so far been discovered in the literature.

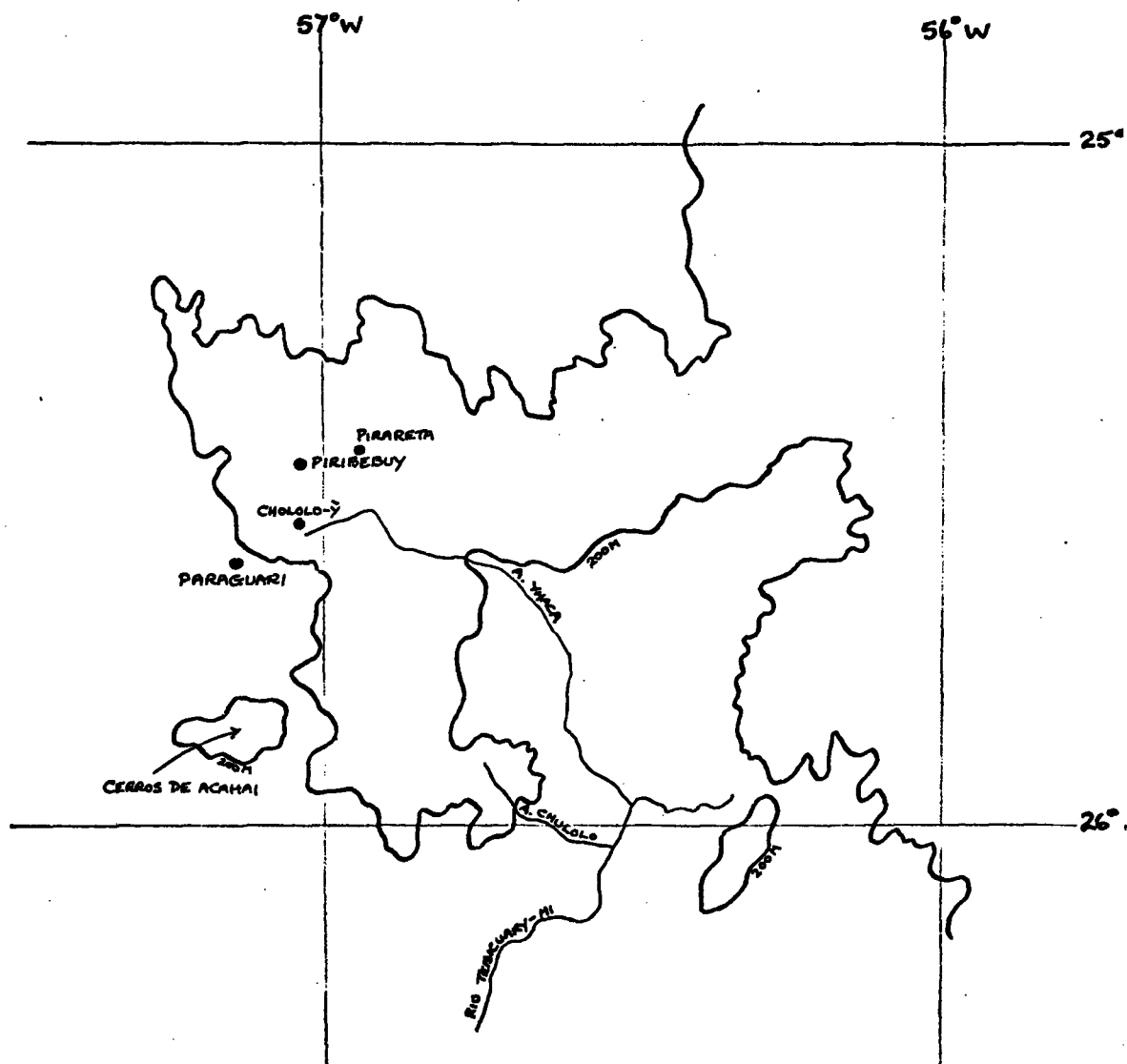
Schelle (1907) lists E. denudatus var. paraguayensis fulvispinus Mundt but gives no details. Backeberg (1959) records G. denudatum variety fulvispinus as "undefined". It is assumed that these two names are synonyms. Schelle (1907) also mentions E. denudatus var. paraguayensis nigrispinus but gives neither author nor description. Backeberg (1959) lists E. denudatus var. nigrispinus as "undefined" and once again it is assumed that the two names are synonyms.

Habitat:

The species has been re-collected recently from the type locality mentioned by Schumann (1903) namely near Chololo in the valley of the river Y-aca, Paraguay. In recent times it has not been collected elsewhere, but in the introduction to Schumann's list of cactus species (1903), presumably written by Hassler, it is stated that the plant comes from the Cerros de Acahãf. A search there carried out in 1969 and reported by Moser (1972) produced no plants of this species, so that this may be an error, but it can hardly be discounted as Moser suggests, on the basis of a single visit, and it is retained here as a possible second locality. No habitat details are available for any of the varieties listed here.

Map references:

CERROS DE ACAHAI	57° 08'W	25° 52'S
CHOLOLO-Y	57° 03'W	25° 35'S
Sheet: G.21 ASUNCION		



Part of Southern Paraguay.

Distribution of G. PARAGUAYENSE

and G. FLEISCHERIANUM.

(Scale: 1" = 16 miles)

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GYMNOCALYCIUM MEGALOTHELOS (Sencke ex Schumann) Britton & Rose

Britton & Rose: The Cactaceae, Volume 3, p.162, 1922.

Synonymy:

ECHINOCACTUS MEGALOTHELOS Sencke ex Schumann, Gesamtbeschreibung der Kakteen, p.415. 1898.

Diagnosis:

Simplex serius proliferans, depresso-globosus vel breviter columnaris, costis 10 - 12 in tubercula praesertim inferne crassa pallide viridia solutis; aculeis radialibus 7 - 8 radiantibus ractis vel subcurvatis, centralibus solitariis; floribus rubescenti-albidis, ovario squamoso glabro. (Schumann 1898)

Varieties:

var. DELAETIANUM (Haage Jr.) Schütz. Fričiana, Rada VI, C40, p. 1966.

Synonymy:

E. DENUDATUS var. DE LAETIANA Haage Jr. Monatsschrift für Kakteenkunde, Volume 8, p.36. 1898.

G. DENUDATUM var. DELAETIANUM Y. Ito, Explanatory Diagrams of the Austroechinocactanae, p.170. 1957.

First description:

Rippen acht, durch Querfurchen gegliedert, unter den Areolen stark kinnförmig vorgezogen, daher der Scheitel gehockert. Areolen etwas eingesenkt, mit sehr reichlichem Wollfilz bekleidet. Stacheln drei bis vier, strahlend, gekrümmt, etwas zusammengedrückt; im Neutrieb braun, dann hornfarbig. (Haage Jr. 1898).

Note:

It is considered by the present author that Britton & Rose based their description on a wrongly identified plant and illustrated that same plant in fig. 173, p.162.

The plant now known as Gymnocalycium megalothelos was first noted in his catalogue by a market gardener called Sencke in Leipzig. The date is not known and it is not clear whether Sencke actually gave the plant its name, but presumably he must have done, as Schumann (1898a) gives Sencke as author when including the plant as Echinocactus megalothelos in his Gesamtbeschreibung. Schumann's description was based on limited material but one plant was said to be an original imported plant from the famous collection of Hermann Gruson, so that the description would appear to be authentic. Britton & Rose (1922) brought it into the genus Gymnocalycium but their description does not follow that of Schumann. Instead they would appear to have been diverted by a plant featured in their book which was collected by Chodat in 1915 and identified by him as belonging to this species. The present author has examined the actual herbarium material of this plant and the original photograph from which fig. 173, p.162 was produced (preserved in the Herbarium of the New York Botanic Gardens) and is convinced that the plant in question is a member of the Muscosemineae group and thus nothing to do with G. megalothelos and outside the scope of this treatment. The coloured illustration in Britton & Rose (Plate XVIII, fig.1.) confirms this impression, while added support is given by Chodat himself in a pencilled note on the herbarium sheet, referring to the flowers which are preserved:- "anthers blackish". Almost sixty years later the yellow pollen still contrasts with the dark anthers when viewed under the binocular microscope and this is a rare feature of just a small group of plants within the genus Gymnocalycium, but belonging as stated above, to the Muscosemineae group. On this basis, the anomalous description of Britton & Rose can be dismissed. Borg (1951) ignores Britton & Rose and briefly summarises

Schumann's original description. Backeberg (1959) likewise keeps very close to the original of Schumann adding that the flowers resemble those of G. monvillei. He quotes Paraguay as the country of origin but then confuses the issue by stating that Chodat collected it there again in 1915, ignoring the fact that the description and illustration of that plant do not really fit his own (and Schumann's) description. Quoting Bozsing as his authority he also asserts that this plant is autogamous and later on in the same paragraph, presumably still quoting Bozsing, that the central spines may reach a length of 3 cm. In his *Kakteenlexikon*, Backeberg (1965) summarises Schumann's description and then states quite categorically that the plant belongs to the formenkreis of G. monvillei. This is very difficult to understand for, although the two species share the same bright green colouration of the plant body and well developed "chins" below the areoles, the resemblance is purely superficial, G. monvillei being a member of the Microsemineae and outside the group under consideration altogether. Krainz (1968) illustrates G. megalothelos and gives Schumann's diagnosis and description in full, adding a supplementary description by Frank of the flower, fruit, and seed which were unknown to Schumann. Two points are of particular interest in the general comments which follow the descriptions. First, it is stated that the central spine mentioned by Schumann is almost always missing from present day specimens. Bozsing's comment implies that the central spine is always present and can be quite large. Krainz goes on to point out that the presence or absence of central spines is a very poor diagnostic character in the classification of some cacti and one cannot but agree with this as the age of the areole concerned often influences the total number of spines present both radials

and centrals. In the Cactaceae in general, additional spines quite commonly emerge years after the original formation of the areole and it must be recalled that Schumann had a very large old plant amongst his material so that the matter of whether or not this species has a central spine is not of great importance. The second interesting point is the opinion expressed by Frank that because of the seed type and the habit of the plant it belongs to the formenkreis of G. denudatum. This is the third possibility to be suggested and yet a fourth was made by Moser (1970) namely that the relationship might lie closer to G. fleischerianum. The last suggestion would seem perhaps to be the most likely. It depends on how widespread Frank considers the formenkreis of G. denudatum to be - he may in fact include G. fleischerianum within it. In ~~which~~ case, he is obviously of the same opinion as Moser.

Another feature of this plant according to several authors is that it is capable of setting seed without ~~cross~~-pollination. Whether this has ever been scientifically tested or is merely the result of chance observations is not clear but in the average collection of *Gymnocalycium*s grown under glass in Europe, the production of fruits containing fertile seed is certainly the exception rather than the rule unless careful hand pollination has been carried out, so that this species could well be self-fertile.

Only one variety of this species occurs in the literature. Schütz (1966), as a result of his studies of the early descriptions of varieties of G. denudatum and commercial catalogues of the period, came to the conclusion that E. denudatus var. de laetiana was probably closer to G. megalothelos than G. denudatum and so published a new combination transferring the variety from the latter to the former

species. However, it should be noted that most of these early varieties of G. denudatum were poorly documented, often based, it would seem, on a single plant of unknown origin and it is extremely difficult to associate the names with any present day examples with any degree of certainty.

Description:

The following description is based primarily on that of Schumann (1898a) but supplemented by Frank (1968) with regard to flower, fruit and seed.

Plant body simple, later proliferating from the base, flattened, almost bun-shaped, later becoming taller and shortly columnar, rounded at the top. Plant body somewhat depressed in the region of the growing point, scattered here and there with tufts of wool and bare of spines. Body up to 16 cm in diameter and almost as much in height, bright green in colour especially in the region of new growth, occasionally darker especially in older plants. The ribs, 10 - 12 in number, and separated by sharp furrows up to 1.5 cm deep, are obtuse and broken up into broad pale green tubercles, especially towards the base, by transverse sinuses, above which are chin-like protuberances. The areoles are 1.0 - 1.5 cm apart, deeply sunken in the sinuses, round in shape, 2.5 mm in diameter, bearing dingy white wool but soon becoming bare. Radial spines 7 - 8, radiating horizontally, awl-shaped, straight or somewhat curved, the lowest pair the largest, up to 1.5 cm long, with sometimes more additional smaller subsidiary spines at the top of the areole. When newly grown, they are clear yellow to somewhat orange-yellow, then becoming dingy brownish yellow and finally horn-coloured. There is a single central spine, somewhat stronger, which stands straight

out. The flowers are pure white or pink tinged, up to 7 cm in diameter and almost 5 cm in height. Pericarpel and receptacle are firm and fleshy, green in colour, with broad fleshy scales. The stamens are numerous, filaments white, anthers yellow. The style is robust, white. Stigma lobes level with the anthers and white in colour. The fruit is egg-shaped, green, and bearing the remains of the dead flower. The seed measures 2 mm x 1.5 mm, is distinctly helmet-shaped, with a raised hilum edge, and has a coarsely warted black testa.

The variety delatianum was described by Haage Jr. (1898b) as follows:

Ribs 8 in number, broken up into tubercles by cross-furrows, and drawn out into strong chin-like projections beneath the areoles. The ribs are "humped" right up to the growing point. The areoles are somewhat sunken, bearing very plentiful wool-felt. Spines 3 - 4, spreading, curved, somewhat appressed, at first brown, later becoming horn coloured. Unfortunately, Haage does not mention flowers, fruits or seeds.

Habitat:

Other than the fact that the plant, as originally collected, was said to come from Paraguay, nothing is known of the detailed distribution of this plant. If it is indeed closely related to G. fleischerianum as some authorities believe then presumably it will originate from the south-eastern half of the country but more than this cannot be said at present in the absence of adequate field data.

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Group J

1. G. denudatum
2. G. horstii

In this group, G. horstii is the uncertain element, as no seed of this species has been examined and it well may be proved to belong to a group outside the scope of this study. Although G. denudatum was amongst the earliest plants of the genus Gymnocalycium to be discovered and has been a favourite plant with amateur collectors and growers in Europe ever since, we have surprisingly little detailed knowledge of this plant in habitat, but the seed undoubtedly places it within the scope of the Macrosemineae.

GYMNOCALYCIUM DENUDATUM (Link & Otto) Pfeiffer

Pfeiffer: Abbildung und Beschreibung Blühender
Cacteen, Volume 2, part 1, 1845.

Synonymy:

ECHINOCACTUS DENUDATUS Link & Otto, Icones Plantarum Rariorum
pp.17, 18. 1828.

CEREUS DENUDATUS Pfeiffer

ECHINOCACTUS DENUDATUS var. TYPICUS Schumann, Gesamtbeschreibung
p. 413. 1898.

Diagnosis:

Echinocactus caule subgloboso virente, costis 6 - 8 obtusatis,
spinis 5 - 8, omnibus patentissimis, calyce involucri phyllis paucis.

Caulis 3 - 4 poll. altus, 3 - 4 poll. crassus. Costae prominentiis
distinctis ad latera impressis obtusissimis, sulcis angustis. Spinae 5 - 8,
omnes 4 - 8 lin. longae, patentissimae et fere incumbentes tortuosae
lana brevi cinctae. Vertex impressus absque lanugine. Flores e costis
prope verticem, inter spinas 2 - 3 poll. longi. Calyx pyxidatus, phyllis
sparsis saepe in circulum compositis ovalibus obtusis parvis, superne
phylla plura longiora acutiora, tandem in corollam transeuntia. Cor.
petala linearia acuta alba. Stam. numerosa corolla multo minora. Stylus
stigmatibus plurimis, vix staminibus major. Fructum non vidimus.

(Link & Otto 1828).

Varieties:

As these are so numerous in the literature, in this particular
instance, they are dealt with under a separate heading following the
description of the species.

The original specimens of this plant were collected by Sellow in Southern Brazil some time prior to 1825 when they first reached the Botanic Gardens in Berlin. It is not known where they were collected. According to Urban (1893) some 3330 herbarium sheets relate to this period of the collector's activities in Brazil and Uruguay and habitat details are completely lacking in most areas. However, from studies of the various journeys made, it is clear that towards the end of 1824, Sellow was working in the vicinity of Pelotas (where in 1922 Parcus collected undoubted specimens of G. denudatum later illustrated by Osten (1941)) and then due to an injury, remained in Sao Francisco de Paula for six months before resuming his travels into the interior early in January 1825. This place is near the coast and the town of Rio Grande, the port from which it is reasonable to assume that live plants would be shipped to Europe. As Link & Otto report (1828) that the plants flowered in May and June of the same year as they were received, they were probably sent off just prior to his leaving the coast for Porto Alegre and the interior. On this evidence, although obviously not conclusive, it seems reasonable to assume that the original material was collected near Pelotas, Rio Grande do Sul, Brazil.

The plant was first described by Link & Otto (1828) as Echinocactus denudatus and later was transferred to his newly erected genus Gymnocalycium by Pfeiffer (1845). The species poses a lot of problems for the taxonomist for a variety of reasons. It is said to be very variable but while this is only too obvious if it is judged on the basis of European grown material at present commercially available, can one assume that this is so in habitat?

A large number of "varieties" of G. denudatum exist in the literature,

most of them only very poorly described, if at all, and often so poorly illustrated that it is of little use trying to match present day plants with them. The habitat of many is merely given as "Paraguay" and others have, one suspects, been described from single plants of unknown origin found in some corner of a European green-house, and which have been propagated for commercial purposes and thereby have acquired some semblance of being genuine on account of the numbers in circulation. Hybrids of greenhouse origin are, of course, a further source of confusion.

Yet another possibility which must be considered is that for a long time now, other species, e.g. G. fleischerianum, G. megalothelos and G. horstii with its variety buenskerei, have often been circulated under the name of G. denudatum. G. horstii for example was published as a new species only in 1970 as a result of its collection by Buining & Horst in 1968 near Caçapava, S. Brazil. Over a hundred and forty years earlier, however, Sallow had collected extensively in that very area and he or his successors could well have gathered specimens of G. horstii regarding them as "varieties" of E. denudatus and sent them to Europe. Even in 1968 when the Linz Botanic Garden received some of Buining & Horst's specimens, still under the collector's number HU79, they were referred to by a spokesman for the Garden as "a beautiful G. denudatum with high steep ribs and pink flowers" ! There seems little excuse for such statements today, confused though the issue may be, but in earlier literature the comment "similar to (or related to) E. denudatus" often occurred, which at first reading seems quite inexplicable today. However, when one considers that these early authors

often knew of only one or two other members of the genus, then these comments can be interpreted in the correct context. For example, Labouret (1858) when describing the flower of G. denudatum itself, says "having the same characteristics as E. hybogonus" (\equiv G. saglione). Today, one can hardly think of a less likely comparison but at the time of writing when few other Gymnocalyciums were known, it was a valid comment and referred merely to the flower tube lacking hair and/or bristles, i.e. thinking in generic rather than specific terms.

Another instance is found in Spegazzini's Cactacearum Platensium Tentamen (1905) where he records (but rejects) Schuman's opinion that E. loricatus (now G. spegazzinii) was a variety of E. denudatus. It is quite clear that Schumann was basing his assumption on the rounded body form of the plant and nothing else. Today it is obvious that such a body form occurs in other divisions of the genus and is not confined by any means to G. denudatum. Careless interpretation of such comments as these have also confused the situation, especially amongst the so-called "varieties" of G. denudatum.

Faced with this situation, one must try to build up some sort of hypothetical framework in order to encompass the bewildering array of species and/or varieties and/or forms which are found in the literature and the equally varied array of plants in cultivation. Schütz (1966) has in fact done this, distributing a number of the G. denudatum "varieties" amongst G. paraguayense, G. fleischerianum and G. megalothelos and reducing others to synonymy. Others still remain, but owing to sheer lack of description and often the absence of any plants resembling them extant in today's collections, little can be done about them.

The nature of the species itself now remains to be clarified. In view of the type locality very probably being in the vicinity of Pelotas, S. Brazil (see comments regarding Sellow above) and the collection, and even more important, the photographic illustration of, material collected there in 1922 by Parcus, it seems reasonable to make the assumption that this is the E. denudatus as described by Link and Otto. In addition, much more recently, Buining & Horst collected material in the state of Rio Grande do Sul, under the number HU28 which would appear to match the photographs of the 1922 collection exactly and tally reasonably well with the earlier descriptions of the species. Two examples in the present author's collection represent the two extremes in body form, i.e. a 5 ribbed and an 8 ribbed specimen. The flowers, both pure white are similar but by no means identical. The differing rib numbers and flower details are, however, well within the kind of variation that one would expect to find in a single species, in contrast to the much wider range of variation postulated by some authors in order to embrace the numerous "varieties". This latter concept of the species, the present author finds unacceptable and quite unworkable in practice.

Apart from material brought to Europe recently under number HU28 (erroneously listed as "G. artigas" in Chileans Year Book 1972) and discussed above, the same collectors introduced other plants, reputed to be a form of G. denudatum, under the number HU7. No information regarding this material is at present available. HU79, also listed as G. denudatum in the Chileans Year Book 1972 has now been described as a species, G. horstii (which see). HU23 has been seen as a label on some plants which were obviously G. denudatum, probably as a mis-reading

of HU28. The number should really apply to a species of Notocactus. HU92 which should apply to G. uruguayense has also been seen allocated in error to forms of G. denudatum. Friedrich Ritter at one time sent material said to be G. denudatum to Europe under his number FRI372 but here again no further information about the plants is available.

Description:

In view of the rather arbitrary decision regarding the nature of Sellow's plant made above, the description which follows is based upon the original description of Link & Otto (1828) but supplemented by Förster (1885) and Osten (1941). The second author is included because of his comments on the fruit which was unknown to the original authors and the third is included because of the good illustration of the plants he describes and their similarity to the present day material of Buining & Horst under "HU28". With Schumann (1898) came the emphasis on five ribbed plants with slightly angular ribs as he illustrates on page 414, fig.72. Backeberg (1959) probably influenced by his own importations of the 1930's seems to favour slightly smaller dimensions of the plant body and slightly shorter flower tubes, while Šubík (1968) differs yet again in his ideas of what constitutes G. denudatum. In fact, he goes so far as to say that "Today, collectors grow two types of G. denudatum, the so-called German type ... and a second smaller type brought to Europe from S. Brazil by C. Backeberg." If this is indeed the case, and it would certainly seem to be so, then the plant illustrated by Osten and assumed here to be the original type of plant would have to form a third type in addition to the two mentioned by Šubík. However, until habitat studies throw more light on the problem,

possibly producing intermediate forms linking all three, it will be assumed that the description given applies to G. denudatum (Lk. & O.) Pfeiffer sensu stricto while there remains one or possibly two other entities which may have to be incorporated into the existing species at possibly varietal level or constituted as separate species in their own right. In the mean time, much needs to be done with existing cultivated material in terms of comparative studies of the flowers, fruits and seeds.

The plant body is a bright grey-green and almost spherical but flattened above, measuring 5.0 - 10.0 cm in height and 5.0 - 15.0 cm in diameter. The growing point is depressed and lacks wool. The ribs, 5 - 8 in number, are flattened at the sides of the plant, very blunt elsewhere, with narrow cross-furrows and bounded on either side by shallow grooves. They at most bear poorly developed tubercles which are confluent. The areoles are oval and bear short wool which is at first yellowish but which later becomes greyish. They are 13 - 18 mm apart. The spines number 5 - 8 and are spreading to appressed, and tend to lie on either side of the areole with a single spine directed downwards. At first yellowish, they later become white. They are 8 - 17 mm in length, somewhat sinuous, and almost bristle-like. Central spines are absent. The flowers, which are pleasantly and delicately scented and last for several days, appear from areoles near the growing point. They are 5.0 - 7.5 cm in height and 6 cm in diameter. The pericarpel is cylindrical, leek green in colour, glabrous, and has on its outer surface a few small kidney-shaped scales which are of a similar green to the pericarpel and measure 3.5 mm in width and 2.0 mm in height. The receptacle is cup-shaped and also bears a few similar scales. Higher up the scales become more numerous, longer, reflexed, more pointed and are also leek-green

with a white margin. The intermediate perianth segments are white with a greyish tinge at the top, finally merging into the petals of the corolla. The corolla tube is white with tinges of green. The petals are linear, acute, white or pale pink and pale greenish on the outside, more sharply pointed and somewhat shorter than the intermediate perianth segments. The stamens, which are greenish white with yellow anthers, are numerous, much shorter than the corolla, being half the length of the inner perianth segments. The style, bright green approaching yellowish above, scarcely longer than the stamens (about 2⁴ mm), bears many radiating off-white stigma lobes. The fruit, a berry, is oval, bearing a few scales and containing 20 - 30 large shining dark brown seeds.

Description of Varieties:

It will be seen from the accompanying check-list that many of the so-called G. denudatum varieties are now dispersed elsewhere. Those that remain, however, are dealt with here in alphabetical order.

1. ECHINOCACTUS DENUDATUS var. ARGENTINIENSIS

This is mentioned by Backeberg (1959) merely as a name and he gives no description and no author. It seems likely that this name arose as a result of the publication by Schick (1923) of the statement that "I received from Capilla del Monte, Argentina ... splendid undamaged specimens of ... varieties of E. denudatus Lk. & Otto". As far as is known, such plants, if correctly identified which seems highly unlikely, were never validly described and published.

2. GYMNOCALYCIUM DENUDATUM var. BACKEBERGII Pazout, Fričiana, Rada 3, Cl5, p.6. 1963.

The original publication and the Latin diagnosis are not to hand but in another article (1963) the translation of the German diagnosis reads as follows:- "Differing from the type in that the plant body is only half the size, and in the smoother ribs, smaller areoles, longer and not curved, downwardly directed spines of a more yellowish colour, and in the conspicuously longer, widely opening, always pure white flowers which have more numerous and narrower perianth segments." Backeberg (1965) however, denies the validity of the taxon, maintaining that such plants are merely juvenile forms of the species. Reference has been made above, in the description of the species, to the possibility of there being more than one "G. denudatum" and there would seem to be sufficient evidence to warrant further careful investigation of this matter at a later date.

3. GYMNOCALYCIUM DENUDATUM var. BRACHYANTHUM

Described as "obscure" by Putnam in his Synonymy (1969). A rather poorly known species, G. brachyanthum (Guerke) Br. & Rose, relegated to a variety of G. monvillei by Backeberg (1959) comes to mind in this context. G. monvillei is placed next to G. megalothelos in his Die Cactaceae, judging from his key, purely and simply due to the general similarity in body size and colour. In fact, the two plants come from quite different seed groups so that the resemblance is purely superficial, but this may account for some authors' association of G. brachyanthum with G. denudatum (via the closely related G. megalothelos) rather than with G. monvillei,

the position taken by Backeberg. However, this is purely hypothetical and until more is known regarding G. brachyanthum (sensu Guerke) no decision can be arrived at.

4. ECHINOCACTUS DENUDATUS var. BRAZILIENSIS

This varietal name was mentioned by Backeberg (1959) but no details were given.

5. GYMNOCALYCIUM DENUDATUM var. DURISPINUM

This is listed as an invalid name of unknown origin by Putnam (1969).

6. GYMNOCALYCIUM DENUDATUM var. FLAVISPINUM Y. Ito, Explanatory

Diagrams of Austroechinocactanae, p.170. 1957.

Synonym:

ECHINOCACTUS DENUDATUS var. FLAVISPINUS Hort. Schelle, Handbuch der Kakteenkultur, p.189. 1907.

No description is given of this plant by Schelle (1907) and it is not known whether Ito describes it, owing to the lack of a translation of the Japanese text.

7. ECHINOCACTUS DENUDATUS var. FLORE ROSEO Labouret, Monographie

des Cactées, p.258. 1858.

First description:

Variété à fleur rose; dans son facies, elle ne présente aucune différence avec l'espèce précédente. Elle ne diffère que par la couleur de la fleur qui est entièrement rose, au dire des amateurs qui l'ont observée. (Labouret 1858).

Labouret (1858) describes it as "a variety with a pink flower; in its appearance it does not differ from the species, save in the colour of the flower which is entirely pink according to amateurs who have seen it". Förster (1885) mentions this variety and adds

that the petals are "spirally twisted at the ends".

8. ECHINOCACTUS DENUDATUS var. MULTIFLORUS

Backeberg (1959) lists this variety but gives no information regarding it. In Volume 14 of *Monatsschrift für Kakteenkunde*, November 1904, p.178, there is a reference to one, Herr Miekley, on the staff of the Royal Botanic Gardens, (presumably Berlin) who brought to a meeting of the German Cactus Society "a selection of plants collected in Bolivia ... and while admitting that they were difficult to identify due to their dried-up condition, he named E. denudatus var. multiflora (sic), E. calochlora and E. multiflorus amongst others". No further description was given unfortunately. When one notes that none of the three species mentioned came from Bolivia, and that the year is 1904, one is tempted to assume that these plants were in fact part of a consignment from Fiebrig which had also produced the plant ultimately to be known as G. guerkeanum and which for years was thought to come from Bolivia, because the Botanic Garden in Berlin had been misled regarding the origin of the plants concerned.

G. guerkeanum is now assumed to be Uruguayan in origin and G. calochlorum and G. multiflorum are from northern Argentina, so that if Herr Miekley's plants came from the same Fiebrig consignment, there is just a possibility that "E. denudatus multiflora" came from Uruguay and was in fact a genuine E. denudatus variety. It is unfortunate however that as yet no description has been found associated with this name which was already in use in 1904.

9. GYMNOCALYCIUM DENUDATUM var. OCTOGONUM Y. Ito, Explanatory Diagrams of Austroechinocactanae, p.170. 1957.

9. (Cont..)

Synonyms:

ECHINOCACTUS DENUDATUS var. OCTOGONUS Poselger

ECHINOCACTUS DENUDATUS var. OCTOGONUS Schumann, In Martius,
Flora Brasiliensis 4²: p.247. 1890.

Schumann's description of the variety is as follows:- "Ribs, separated right to the base by means of deeper sinuses, having transverse grooves, and being obviously tuberculate and impressed at the sides; stem of a paler green."

So far, no reference to Poselger's publication has been found.

10. ECHINOCACTUS DENUDATUS var. ROSEUM Hildmann, Kakteenkunde,
p.183. 1936.

It should be noted that var. roseiflorus Hildmann (roseiflora Hildmann in Schumann's Gesamtbeschreibung 1898) has been placed under G. paraguayense by Schütz (1966). This name could be just another variant and really belong there too. On the other hand, Backeberg (1959) has expressed the opinion that it is a hybrid, on the basis of the photograph in Kakteenkunde, p.183, 1936. The present author is inclined to the view that the plant is the photograph is not G. denudatum but could well belong under G. paraguayense which, in fairness, Backeberg had not seen at the time of writing.

Hybrid forms of G. denudatum:

1. GYMNOCALYCIUM cultivar JAN SUBA. Pazout, Fričiana, Rada 1,
C7, 1962.

Diagnosis:

Differt a typo G. denudatum var. backebergii floribus
carmineis, autofertilibus. (Pazout 1962)

1. (Cont..)

This hybrid was described as G. denudatum var. backebergii x G. baldianum and the Latin diagnosis reads as follows:- "Differing from the type of G. denudatum var. backebergii by its carmine flowers and self-fertility." Elsner (1970) describes how the original cross produced plants very similar to the G. denudatum var. backebergii parent, but with pink flowers. The F₁ generation was self-fertile and the F₂ generation produced plants of uniform G. denudatum appearance once again but with a range of flower colour from white to the deep red of G. baldianum. He continues "From chosen specimens with large pink flowers, Mr. Pazout obtained a stable hybrid." Illustrations seen do not always bear out the stability of the hybrid, but it could well be that many other growers have repeated the cross with varying results.

2. ECHINOCACTUS INTERMEDIUS

Under this name, Putnam (1969) confuses two possible plants of the same name. They are:-

- 2a. ECHINOCACTUS INTERMEDIUS Hildmann. Gartenzeitung
Volume 4, p.479, fig.111, 1885.

This is reputed to be a hybrid between E. denudatus and E. monvillei.

- 2b. ECHINOCACTUS INTERMEDIUS Hort. Monatsschrift für Kakteenkunde,
Volume 8, p.36. 1898.

This plant was mentioned, but unfortunately not described, in an article by Haage Jr. He states that it was generally regarded as a hybrid between E. denudatus and E. multiflorus and implies that it was quite common and well known. Schumann (1898) also describes it as "widely

distributed." Hirscht (1902) mentions "variety intermedius" which he describes as a very beautiful hybrid between E. denudatus and E. multiflorus which was, in his time, widespread in German collections. The spines are said to have lost their spider-like appearance and to resemble those of E. multiflorus. Borg (1951) mentions "various natural hybrids with G. multiflorum" but as the distributions of the two species as now understood do not overlap, this statement is difficult to understand. The combination Gymnocalycium intermedium has also been reported from the literature in more recent years, and a plant bearing this name is illustrated by Ginns (1966).

3. ECHINOCACTUS HYBRIDUS Haage & Schumann

This plant is mentioned by Backeberg (1959) with no reference, and the original publication has not so far been traced, but Schumann (1898) makes no mention of it. According to Backeberg it is a hybrid between E. denudatus and E. quehlianum and was illustrated by Schelle (1926) but under the name of E. denudatus var. paraguayensis Hge. Jr. The present author is not familiar with the illustration mentioned, but Schelle's earlier work (1907) shows possibly the same photograph, obtained from De Laet, and it could indeed be a hybrid, its appearance not really matching that of E. denudatus var. paraguayensis (now known as G. paraguayense) Backeberg doubts the continued existence of this hybrid in collections, though presumably it could occur accidentally from time to time.

3. (Cont..)

Schütz (1966) mentions the occurrence of various hybrids over the years since the original discovery of G. denudatum by Sellow and in particular, crosses with G. megalothelos, but no actual names, valid or otherwise, are recorded.

General comments:

Prior to the work of Schütz in the early 1960's, there seemed to be such a bewildering variety of plants under the name G. denudatum, that hybridity seemed an obvious (and easy) explanation of the situation. However, now that a number of them have been allocated as varieties to other species, the position is, at least superficially, somewhat clearer. Chromosome counts for the species and their varieties might provide a way of verifying the suggested re-allocation of varieties, but not necessarily so. The comparative ease with which inter-specific hybrids seem to be produced within this genus, might indicate similar chromosome counts for some or even all of the individuals involved. Chromosome counts for the Cactaceae would appear to have been very largely done on North American material, but Rowley (1968) quotes counts for three Gymnocalyciums, two of which are species dealt with in this study, and all have a diploid complement of 22, so that this technique may not offer a solution to the problem after all.

The whole question of G. denudatum varieties and/or hybrids needs very careful investigation. Another, long-term, approach to the problem (5 - 10 years) would be an attempt to re-create, under carefully controlled conditions in the greenhouse, the plants mentioned as hybrids in the literature and it seems well within the bounds of possibility that as a result of these attempts, some of the old established "varieties" of

G. denudatum might well emerge once more.

Habitat:

Habitat details are surprisingly sparse considering the length of time this plant has been known, and its popularity with European cactus collectors. As previously discussed, Sellow probably collected the first plants in the vicinity of Pelotas, but in any case, most certainly Southern Brazil. In the Flora Uruguaya (1905) Arechavaleta records the occurrence of G. denudatum in Tacuarembó province and from near Rivera on the Uruguay-Brazilian border. Spegazzini (1905) describes the plant as "very rare in the hills near Santa Ana, province of Misiones, Argentina and likewise near Carmelo on the Río Uruguay, in the region of Montevideo (Uruguay)". Both these are localities not mentioned by other authors and they lie on the north-western and south-western extremities respectively of the distribution area for this plant. Spegazzini goes on to say that "My own specimens look very much like variety heuschkelianus Haage Jr. ...". In the light of Schütz's allocation of this variety to G. fleischerianum and the geographical aspects of the Spegazzini habitats, considerable doubt is cast upon their validity and it would seem unwise to quote them as habitats for G. denudatum sensu stricto without present day confirmation from the field. Hosseus (1926) lists Misiones, Argentina, as a habitat for G. denudatum but whether from personal experience or merely quoting Spegazzini, is not clear. Osten (1941) gives the area near Pelotas, Brazil as the source of the plants he describes and illustrates, while Müller-Melchers (1947) reports the finding of pink flowered plants of G. denudatum at the watershed near Paso de Mataperro (sic). Herter (1954) gives the habitat of the plant in Uruguay as the provinces of Rivera, Tacuarembó and Treinta y Tres.

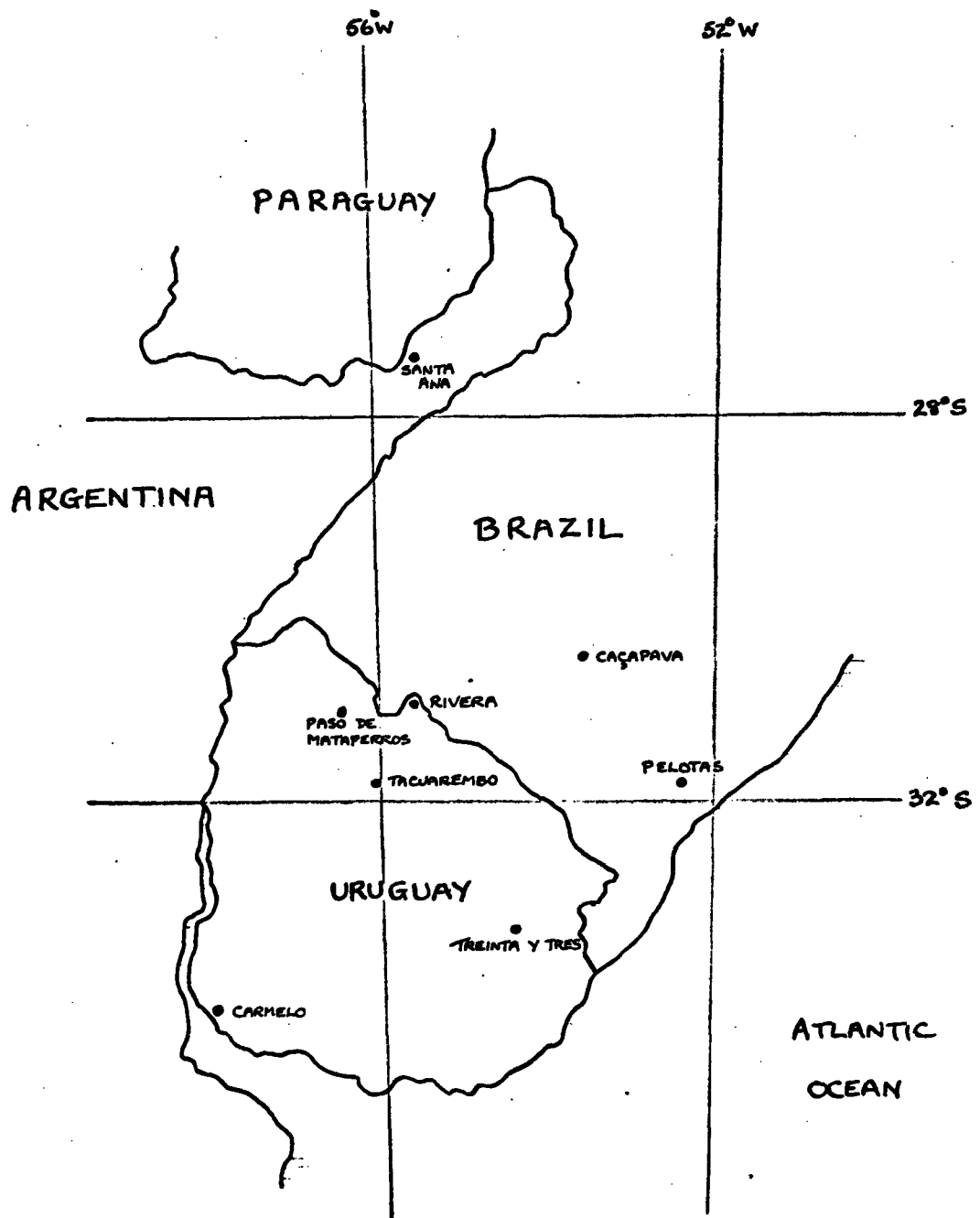
Buining and Horst (1967) reported finding G. denudatum in the Serra do Caçapava, but their plant HU79 which came from this area is now regarded as a new species, G. horstii. Whether or not their plants HU7 and HU28 - the latter most certainly G. denudatum - came from the same area is not clear, but the general area was the state of Rio Grande do Sul, Southern Brazil.

Map References:

SANTA ANA	55°35'W	27°22'S
CAÇAPAVA	53°30'W	30°30'S
RIVERA	55°34'W	30°54'S
TACUAREMBO	56°02'W	31°40'S
PASO DE MATAFERROS	56°25'W	30°58'S
PELOTAS	52°20'W	31°40'S
TREINTA Y TRES	54°21'W	33°15'S
CARMELO	58°18'W	34°00'S

Sheets: G 21 ASUNCION
 H 21 URUGUAYANA
 H 22 PORTO ALEGRE
 I 21 BUENOS AIRES - MONTEVIDEO

Note: In the text, the provinces of Rivera, Tacuarembó and Treinta y Tres are referred to. The references given above are to the major towns in these provinces, bearing the same names.



Parts of Argentina, Paraguay, Brazil & Uruguay.

Distribution of G. DENUDATUM.

(Scale: 1" = 105 miles)

Check List of Varieties of G. denudatum
(Alphabetical order)

- G. denudatum var. andersohnianum)
E. denudatus var. andersohnianus) See under G. fleischerianum
E. denudatus var. andersohnii)
- E. denudatus var. argentiniensis
G. denudatum var. backebergii
- E. denudatus var. boliviensis See under G. guerkeanum
- G. denudatum var. brachyanthum
E. denudatus var. braziliensis
- G. denudatum var. brunnowianum)
E. denudatus var. bruennowii)
E. denudatus var. brunnowianus) See under G. paraguayense
E. denudatus var. bruenovianus)
- G. denudatum var. delaeitianum)
E. denudatus var. delaeitii)
E. denudatus var. delaeitianus) See under G. megalothelos
E. denudatus var. de laetianus)
- G. denudatum var. durispinum
G. denudatum var. flavispinum
E. denudatus var. flavispinus
E. denudatus var. flore roseo
- E. denudatus var. fulvispinus)
G. denudatum var. golzianum) See under G. paraguayense
E. denudatus var. golzianus)

Check List of Varieties of G. denudatum (Cont..)

- G. denudatum var. heuschkelianum)
E. denudatus var. heuschkelianus)
E. denudatus var. heuschkelii)
E. denudatus var. heuschkehlui) See under G. fleischerianum
G. denudatum var. meiklejohnianum)
E. denudatus var. meiklejohnianus)
E. denudatus var. meiklejohnii)
- E. denudatus var. multiflorus
- E. denudatus var. nigrispinus See under G. paraguayense
- G. denudatum var. octogonum
E. denudatus var. octogonus
- G. denudatum var. paraguayense)
E. denudatus var. paraguayensis)
E. denudatus var. paraguayensis fulvispinus) See under G. paraguayense
E. denudatus var. paraguayensis nigrispinus)
- G. denudatum var. pentacanthum See under G. horstii
- G. denudatum var. roseiflorum)
E. denudatus var. roseiflorus)
E. denudatus var. roseiflora) See under G. paraguayense
- E. denudatus var. roseum
- G. denudatum var. scheidelianum)
E. denudatus var. scheidelianus)
E. denudatus var. scheidelii)
G. denudatum var. wagnerianum)
E. denudatus var. wagnerianus)
E. denudatus var. wagneriana) See under G. paraguayense
E. denudatus var. wagnerii)
G. denudatum var. wieditzianum)
E. denudatus var. wieditzii)

- Note: (i) Only those without brackets currently belong
under G. denudatum
- (ii) A number of names have a variety of spellings in
the literature - all encountered have been listed
here for the sake of completeness.

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GYMNOCALYCIUM HORSTII Buining

A.F.H. Buining: Kakteen und andere Sukkulente,
Volume 21, No.9, p.162. 1970.

Diagnosis:

Corpus simplex, ad 11 cm diam., ad 7 cm altum, viride, radicibus capillaribus instructum; costae 5(6), inferne ad 7 cm latae, areolis 3 (-5) ovalibus, ca. 3 cm inter se remotis; spinae plerumque 5, ad 3 cm longae, rectae, durae, rigidae, divaricatae pallide luteae vel albidae; flores ad 11 cm longi et lati; pericarpellum ad 25 mm longum et 12 mm diam., squamulis roseis vestitum; tubus floralis ad 35 mm longus, infundibuliformis, squamulis roseis ornatus; perianthii phylla lanceolata, albida vel lilacino-rosea, stamina pallide lutea; stylus 30 mm longus, ad 4 mm diam., pallide luteus, stigmatibus 9 ornatus; fructus ovalis, 5-6 cm longus, 3-4 cm diam., viridis coeruleo-suffusus; semina pileiformia, 1.3 mm longa, 1.2 mm lata, testa nitida, verruculis subglobosis obsita, hilo tela spongiosa referto, funicula et micropyle subdepressis. (Buining 1970).

Synonymy:

None, but plants raised from Born's seed, catalogue number "K1263, sp.79" could well be this species.

Variety:

GYMNOCALYCIUM HORSTII var. BUENEKERI Buining (loc.cit.)

Diagnosis:

A typo corpore atroviridi, spinis crassioribus, floribus roseis differt. (Buining 1970).

Note: It is highly likely that G. denudatum var. pentacanthum Fleischer nom.nud. belongs here as a synonym of the variety.

bert

Gymnocalycium horstii was first described by Alfred Buining (1970) as recently as 1970, and named after the finder Leopoldo Horst, of Brazil. At first thought to be another variety of G. denudatum, on closer examination it soon became obvious that this was not so. The plants were less flattened than G. denudatum and the spination was different as were also the flowers. The fruits proved to be much larger than those of G. denudatum and instead of becoming dry when ripe and producing a close-packed mass of large seeds, G. horstii produces smaller seeds dispersed in a mass of juicy tissue. The shape of the seed too is different and Buining places it in the Mostiana (Series IV) of Buxbaum's seed classification. The present author has so far been unable to obtain samples of seed of this species but from the drawings accompanying the original description, this would seem a rather strange choice, but further useful comment cannot be made until such time as material becomes available.

The variety G. horstii var. buenekeri was also published at the same time (1970) and commemorates the finder Heinz Bueneker. Its flower is said to be of a slightly different colour and the plant originates from an area some 200 Km northwest of the type.

The species is said to be very free-flowering in habitat and also blooms readily in cultivation in Europe. It grows on, or at the foot of, the steep slopes of a flat-topped mountain and in somewhat sheltered conditions together with a Gesneria species and Echinopsis multiplex. Consequently in cultivation it requires some protection from direct sunlight even in Europe. It is said to proliferate much more readily in cultivation than in habitat, and cultivated specimens tend to have a greater number of ribs. In Brazil, the flowers of the type open

for 5 - 6 consecutive days whereas those of the variety open only on two days. This may well be another result of the more sheltered position of the species compared with that of the variety, which grows in the open on flat rocks bordered with grass. Its greater exposure to the sun may also account for its deeper green colour compared with the species.

One cannot help but notice the distinct similarity between G. horstii var. buenekeri and the plant generally known as G. denudatum var. pentacanthum. Unfortunately, habitat details of this plant have not as yet become available, the name having been given by Fleischer but without a description of any sort. Bayr (1969) says of it that the seeds are much smaller and of a different shape from those of the species (G. denudatum), and that it produces large creamy white flowers in abundance. Whether he writes of a single specimen or a selection of such plants is not clear, but Donald (1970) gives the dominant flower colour as rose pink and this certainly checks with G. horstii var. buenekeri. The second author continues by remarking on the peculiar rough matt surface of the plant body, its dull grey-green colour and the exceptionally large flower size (up to 8 cm diameter) which he contrasts with the average 4 - 5 cm diameter flowers of G. denudatum; all these being features of the G. horstii variety also. It could well be that these two plants are identical although collected at widely separated times and thus receiving different names.

It is also interesting to note that in the present author's reference collection there is a plant very closely resembling, if not actually identical with, the type of G. horstii, which was grown from seed supplied by Born of Germany under his number "K 1263, species 79". This plant must surely be a product of the original gathering by Buining in 1965 or 1966.

Description:

The following is based entirely on the original description (1970) and the Latin diagnosis. Where there are small discrepancies, these are noted.

Plant body simple, up to 11 cm in diameter, and to 7 cm in height. Very old examples somewhat taller. Fresh green colour; when plants are in full growth, shining green. Fibrous rooted. Ribs 5, sometimes 6, up to 7 cm broad at the base, blunt but not completely flat, somewhat raised in the middle region, no tubercles or only very weak ones. Areoles 3 per rib, sometimes a few more, somewhat woolly, oval, up to 5 mm long and 4 mm wide, and about 3 cm apart. Spines hard, rigid, straight, standing out obliquely, not appressed to the body, as a rule 5 in number, a pair on either side and one single one below, lacking central spines, pale yellow to whitish-yellow ("whitish" in the Latin), up to 3 cm long. Flowers up to 11 cm long and just as wide, opening fully in direct sunlight, open from morning until nearly evening. Externally, the pericarpel measures up to 25 mm long and to 12 mm in diameter, while internally, the cavity of the ovary is up to 18 mm long and to 8 mm wide. The outside of the pericarpel is covered with small pink scales. Receptacle to 25 mm in length ("floral tube to 35 mm long" in Latin), funnel shaped, green, bearing 12 pink-coloured scales. Petals to 6 cm long and up to 14 mm wide, pointed, lilac-pink to creamy white with a deep pink mid-stripe. Outer petals deep pink. Nectar chamber with only one nectary, very small, almost non-existent. Primary stamens inserted close to the base of the style and the secondary stamens further away, distributed over the whole of the receptacle right up to the edge; pale yellow in colour as are the

anthers. Style to 3 cm long and 4 mm thick, pale yellow with nine stigma lobes. Fruit oval, 5 - 6 cm long and 3 - 4 cm wide, with 10 - 12 scales, measuring from 8 - 12 mm wide; green with a bluish tinge in colour. Flesh of the fruit very watery and pure white. The bloom on the fruit lasts noticeably longer than in the case of the already known Gymnocalycium species from Brazil; as in their case, the fruit splits longitudinally. The seed is cap-shaped, 1.2 mm broad and 1.3 mm high, the testa being faintly lustrous ("shiny" in the Latin) with small, flattened, round ("almost spherical" in the Latin) chestnut-coloured projections and black in between. The hilum is filled with a spongy tissue of an ochre colour. The point of attachment of the funiculus, and the region of the micropyle are somewhat depressed.

G. horstii var. bueneri differs from the type by way of the larger spines, the dark green epidermis and the deep pink flowers.

The type plant, under the collection number HU79 is placed in the Herbarium of the University of Utrecht, Holland. G. horstii var. bueneri was given the number HU 363 (1972).

Habitat:

G. horstii was collected from a single location near Caçapava, Rio Grande do Sul, Brazil. It is described as being "very local".

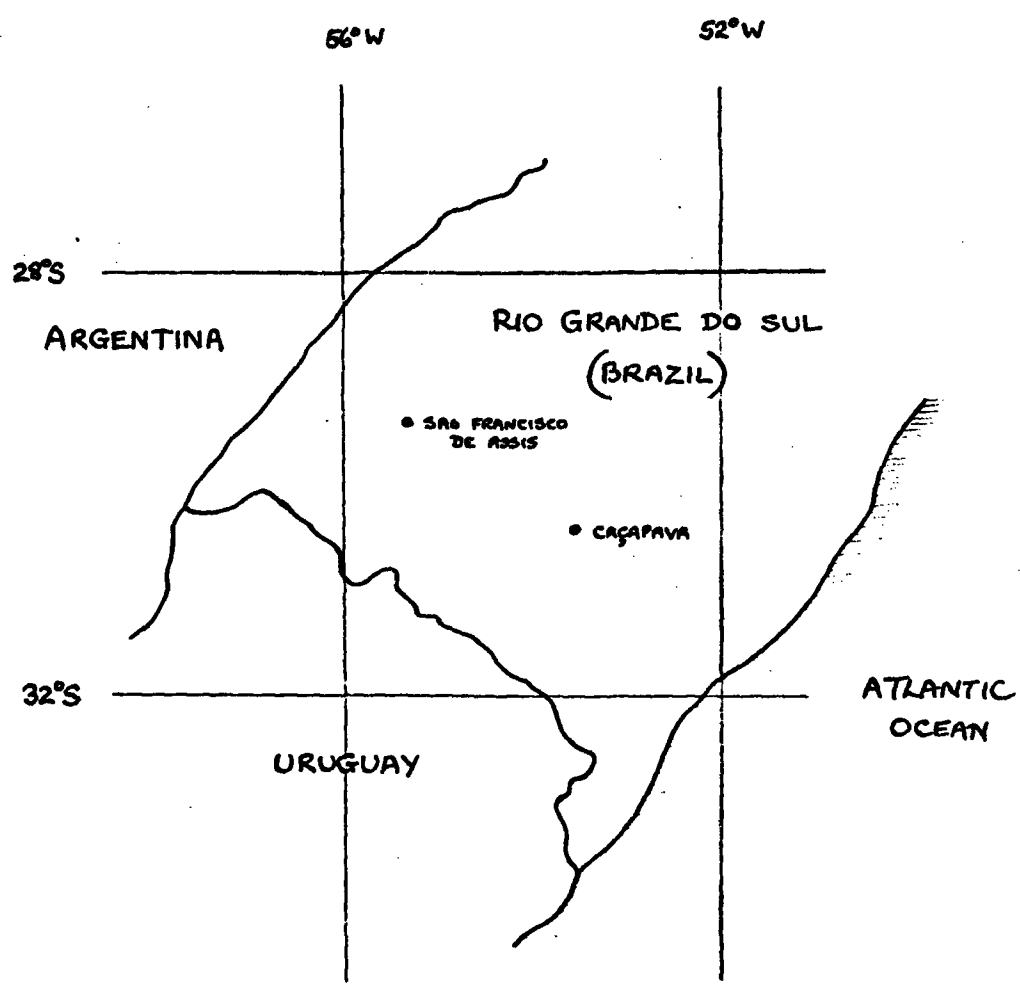
The variety was collected from a region of flat rocks near Sao Francisco de Assis, about 200 Km N.W. of Caçapava. Again it is described as "very local".

Map references:

CAÇAPAVA	53°30'W	30°30'S
SAO FRANCISCO DE ASSIS	55°08'W	29°34'S

Sheets: H 22 - PORTO ALEGRE

H 21 - URUGUAYANA



Southern Brazil.

Distribution of G. HORSTII.

(Scale: 1" = 105 miles)

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Two species of doubtful identity but which are sometimes associated with the plants already described in this study.

1. G. hamatum
2. G. stuckertii

GYMNOCALYCIUM HAMATUM Ritter, nomen nudum

Backeberg (1959) mentions this plant right at the end of his account of the genus Gymnocalycium, stating that it was at that time unfamiliar to him. He quotes Ritter's collection number, FR 819, and adds in inverted commas as if quoting another author, "dark green, flat, beautifully patterned; the spines terminating in a delicate little hook." He may well have been quoting from a commercial catalogue of the day. In the ^eKakteenlexikon (1965) he states that the plant is "apparently undescribed until now" but strangely enough, does not make a new combination or give a Latin diagnosis, however brief. His description is as follows:-

Body rounded, ribs 9, rounded, with cross-furrows. Radial spines 6, radiating, outstanding, to 1.5 cm long, the lowest one the longest, at first whitish yellow, brown above, then horn-grey. Centrals absent. Flowers and origin unknown.

He concludes by saying that the specimens he had seen did not have hooked lower radials, but spines which were more or less only slightly curved at the tip. In the present author's experience, this type of spine is not at all common in the genus and is shown by relatively few plants all of which come into one group of the Muscosemineae. However, Backeberg (1965) puts the plant into sub[^]genus 2, whereas all the Muscosemineae occur in sub[^]genus 3, and as the key for separating these two sub[^]genera depends on flower characteristics and Backeberg had already stated that the flowers were unknown, it is difficult to see the reason for his decision.

Unfortunately, in some way or another, the collector's number FR 819

has also become associated with G. guerkeanum, but as the description of the spines with their hooked tips bears no resemblance to those found on this plant, it seems reasonable to ignore it.

De Herdt, a well known Belgian Cactus dealer offers seed of "G. hamatum" in his 1974 Catalogue accompanied by the phrase "strong spines hooked at the tip". so that this would appear to be the plant sensu Ritter.

Another complication has arisen since Backeberg's time in the form of another nomen nudum, namely G. hamatum sensu Karel Knize. A collector and dealer at present based in Lima, Peru, he offers in his 1974 seed list under his own catalogue number of 584, seed which is clearly not G. guerkeanum (Macrosemineae) nor the plant referred to by Ritter under this name, (Muscosemineae). It does in fact belong to the Microsemineae group and probably belongs to the group of plants which centres on G. pflanzii. Another alternative is offered by Donald (1972) who was of the opinion that the Knize version of G. hamatum was identical to G. cardenasianum, which is a member of the Microseminae seed group but a different sub-division ^{from} ~~to~~ the G. pflanzii previously mentioned.

It is quite clear from the foregoing comments that much remains to be done before this name can be used with any degree of certainty, if indeed, it need be retained at all.

GYMNOCALYCIUM STUCKERTII (Speg.) Britton & Rose

Britton & Rose: The Cactaceae, Volume 3, p.165. 1922.

Synonymy:

ECHINOCACTUS STUCKERTII Spegazzini, Cactacearum Platensium Tentamen,
In the Anales del Museo Nacional de Buenos Aires,
Volume, 3, No. 4, p. 502. 1905.

GYMNOCALYCIUM STUCKERTII (Speg.) Spegazzini, Nuevas Notas
Cactológicas, In the Anales de la Sociedad
Científica Argentina, Volume 99, p. 134. 1925.

(This is a superfluous combination, post-dating that of Britton & Rose)

GYMNOCALYCIUM STUCKERTII Frič, Nomen nudum.

Note:

The synonymy given here should be treated with caution. The plant to which Frič gave this name was almost certainly a member of the seed group MUSCOSEMINEAE while at least some of the modern authors apply the same name to plants of the OVATISEMINEAE. We are uncertain as to which of these two groups Spegazzini's plant belonged. Putnam (1969) has even suggested that Frič's plant should really be referred to G. fleischerianum but he gives no reasons for this, and as G. fleischerianum is a member of yet another seed group and its distribution, as far as it is known, is far removed from the area in question, this theory would seem to have little to support it.

Diagnosis:

Hybocactus e globoso depressus obscure viridis centro leniter
umbilicatus, costis 9 - 11 latis obtusis validiuscule dentatis, tuberculis
majusculis saepius basipete acute gibbosis; areolis ellipticis; aculeis
omnibus marginalibus 7 - 9, quorum 6 - 8 lateralibus horizontalibus,
altero infimo verticali e terete compressulis adpressis leniter recurvis

cinereis apice fuscescentibus; floribus e margine disci erectis mediocribus, extus glaberrimis e livescente obscure viridibus, subloricato-squamosis, petalis subspathulatis longe angustaque unguiculatis ex albo subroseis, stigmatis laciniis 12 albis. (Spegazzini 1905).

Echinocactus stuckertii was first described by Dr. Carlos Spegazzini (1905) and was named after T. Stuckert who aided Dr. Spegazzini in his study of the Cacti of Argentina. No illustration of any kind was given with the original description. When Britton & Rose came to write their monograph (1922) they placed this species in the genus Gymnocalycium. Their brief description does not tally entirely with that of Spegazzini. For example, the spines are now described as "pinkish to brown" while the original said "ash grey becoming darker at the tip." The body is described as "sometimes depressed" instead of the original "depressed". The ribs are said to be "obtuse" while Spegazzini stated "in their upper parts raised and acute, flattened and blunt towards the base.". The flowers have become 40 mm in length instead of 40 mm in diameter as in the original, and the scales on the flower tube "broadly ovate" instead of "semi-circular".

The new description would appear only to add to the original uncertainty as to the nature of the plant itself. A further complication stems from the photograph, given to Britton & Rose by Dr. Spegazzini to illustrate the species. It is difficult to gain much information from the photograph, but the flowers appear to arise from near the growing point, not from the edge of the plant body as Spegazzini describes, and some areoles appear to have central spines which again contradicts the

original description, and the spines stand out from the plant body instead of being appressed. Identifications from photographs however are notoriously unreliable and so undue emphasis should not be placed on the above observations.

According to Hosseus (1939), Spegazzini does not mention this plant again except as an entry in the key to species when writing his *Nuevas Notas Cactológicas* (1925) and Hosseus suggests that this might indicate the original author's uncertainty as to the validity of the species. On the other hand, Spegazzini similarly omits from the text of the same work *G. saglionis*, *G. denudatum*, *G. damsii*, *G. schickendantzii*, *G. gibbosum* and *G. multiflorum* but it seems unreasonable to conclude that Spegazzini was uncertain of the validity of these species also!

Apparently, neither herbarium material nor authentic descendants of plants collected by Spegazzini at that time, now exist, and even Stuckert lacked a specimen in his own herbarium which is now in the possession of the University of Cordoba. What then, is the position regarding this species today?

There would appear to be two schools of thought regarding this elusive species. One originates with Backeberg (1959). His description which corresponds to neither that of Spegazzini nor Britton & Rose completely, although given under the name "*G. stuckertii* (Speg.) Br. & R." states:- "ribs at first projecting, later more flattened" which is presumably a mis-translation of Spegazzini's "in their upper parts raised and acute, flattened and blunt towards their bases." "Moderately large tubercles" becomes "medium sized", "areoles elliptical, 7 - 9 mm long, 4 - 5 mm wide" becomes "areoles 5 mm in diameter". Backeberg had

G. STUCKERTII

(Comparison of various authors' accounts)

Feature	Spezzazini 1905	Britton & Rose 1922	Dölz 1957	Backeberg 1959 & 1965
Plant Body	Flattened spherical, moderate size, 60 - 65 mm ϕ , 30 - 40 mm high. Torus slightly concavo-umbilicate. Dark green apex tubercled but nearly bare of spines. Sparse bristly hair, short, between tubercles. Habit of <i>E. hyptiacanthus</i> Lem. but smaller with tubercles on ribs less well developed.	Plant globose, sometimes depressed, dull green 6 - 6.5 cm ϕ , 3.5 - 4.0 cm high.	Flattened spherical, dark green, in the region of 6 - 7.5 cm ϕ , 3.5 - 4.0 cm high. In cultivation, somewhat taller.	Up to 6.5 cm ϕ and 4 cm high with somewhat sunken growing point, this somewhat felted. Rounded, dark green.
Ribs	Ribs 9 - 11 fairly robust, dentate, upper parts raised, acute, lower down towards the base, flattened and blunt. Usually formed from 3-5 tubercles, the latter fairly large and usually with acute humps on the lower surface.	Ribs 9 - 11, obtuse.	9 - 13 separated by deep almost straight longitudinal furrows and divided up into moderately large tubercles by cross-furrows.	Ribs 9 - 11, at first raised, later more levelled off and with medium sized tubercles, rounded, weakly chinned.
Spines	Radials only, 7 - 9, 6 - 8 are lateral, one directed downwards. All appressed and moderately reflexed, ashen colour with darker (or brownish-grey) tips. Centrals always absent. Woody-rigid, 10 - 24 mm, coarsely scaly, dusty, flattened-circular.	All radial, pinkish to brown, flattened puberulent (minutely hairy, downy, GJS) 1 - 2.5 cm long, somewhat spreading.	Only radials, 6 - 8 in pairs arranged laterally, the lowest single spine directed downwards, all somewhat reflexed. At the growing point they are more outstanding and over-top it. Spines 10 - 24 mm, the lowest often but not always the longest. All are round, woody, stiff and piercing. At first brown, paler at the base, later ash-grey, somewhat scaly, brown only at the tip.	Radials only 7 - 9, mainly directed sideways. A single one towards the base, rigid, up to 2.4 cm long, scaly-hoary, pink to brown.
Areoles	Elliptical areoles 7 - 9 mm x 4 - 5 mm wide, rather widely separated (10 - 15 mm)	---	---	Up to 15 mm apart, to 5 mm ϕ .

G. Stuckertii - Comparison of various authors' accounts (Cont...)

Feature	Spegazzini 1905	Britton & Rose 1922	Döhlz 1957	Backeberg 1959 & 1965
Flower	Often solitary, arising from edge of the torus, erect, medium size, 4 cm ϕ , not scented. Scales on the outside semi-circular, purplish green and quite robust, with white margins tinged with violet, gradually merging into the petals above which are somewhat fleshy. No hair or spines on flower. Flower tube becomes dark bluish green. Petals almost spatulate with long and narrow claws. Flower colour from white to almost pink.	4 cm long. Scales on the ovary and flower tube, scattered, broadly ovate, scarious margined. Flower tube rather short. Inner perianth segments nearly white.	On shoulder of plant and from upper side areoles, up to 4.5 cm long and opening to about 4.0 cm ϕ . Ovary short, close to $\frac{1}{3}$ of the whole flower. 13 mm long x 8 mm ϕ , bright to dark green. Scales close together, large, 4 - 5 mm at the base, semicircular, yellowish green with broad whitish, sometimes whitish-violet tinted border. Flower tube short, hemispherical, up to 2 cm ϕ at top. Sepals on the outside, at first green with white border, then white with broad green or somewhat brownish-violet central zone, and borders brownish-white. Outer petals dirty white with a more or less deeply coloured yellowish-olive central zone on the outer surface. About 8 cm long (ERROR! G.J.S.) Inner petals dirty white with faint yellowish inner zone, 2.2 cm long, the innermost 1.7 cm long, all almost spatulate to narrow "nail-shaped" (? G.J.S.)	4 cm ϕ , erect. Ovary tube dark green. Scales semi-circular with lilac-white border, merging into the perianth segments above. Petals almost spatulate, somewhat fleshy, whitish to pink.
Stamens	Filaments and pollen yellowish.	---	Filaments in two groups, white, lowest only 7 mm long. Anthers pale brownish-yellow.	Anthers yellowish
Pistil	Style greenish with 12 white stigma lobes.	---	Style greenish-white, paler at the top, moderately long stigma lobes 1.6 cm long overall (ϕ ? G.J.S.). Lobes 9 yellowish white. Same height as lowest parietal anthers. Seed Muscosemineae.	Style greenish
Origin	In very dry hills, provinces of San Luis, Cordoba, Tucuman, and Salta, Argentina.	Province of San Luis Potosi, Argentina and generally in N. Argentina.	Same as Spegazzini (Column 1)	Same as Spegazzini (Column 1)

obviously seen Spegazzini's original description but had modified it to some extent, and also had not followed the description of Britton & Rose in detail either, for he disagrees with them over spine colour. This contribution by Backeberg serves to confuse the issue still further.

The same author then suggests that G. stuckertii should be included in the G. sutterianum - G. sigelianum complex, or possibly regarded as actually representing both of these more recently named species (agreed by most authorities to be closely related if not identical) because, he states, "Spegazzini's description fits these two very well." That is an opinion with which some, perhaps, would not agree, and possibly with some justification.

The other school of thought maintains that the Czechoslovakian field collector Frič re-collected G. stuckertii and introduced it, probably for the first time, into Europe, probably during the 1920's. According to Pazout (1969) he collected his seed "from south of the Bermejo river." This river, in its upper reaches, runs through the province of Salta, Argentina, so that at least this plant could have originated from one part of the distribution area quoted by Spegazzini. Frič based his identification on the photograph from Spegazzini published by Britton & Rose (1922) and his plants belonged to quite a different sub-division of the genus Gymnocalycium centred around G. schickendantzii. Pazout (1969) describes how he himself remembers the uniform seedlings which resulted from this collected seed and from which, very large specimens up to 30 cm high occasionally are still encountered in European collections. The plants are said to have very long spines and relatively small whitish flowers from the lateral areoles. The red spherical fruits contain typical pale brown seeds of the G. schickendantzii group.

According to Frank (1963), a cactus grower called Valenta from Bratislava, Czechoslovakia, had for several decades imported Cacti from Argentina amongst which Frič had also identified plants thought to be G. stuckertii. A striking divergent form was selected from amongst these plants and grown on under the epithet "similar to stuckertii" and this has more recently been described as a new species by Fleischer (1962) under the name G. pungens.

As a result of this, all plants of G. stuckertii having pale brown seed of the G. schickendantzii type would fall, presumably, into either the new species G. pungens, or revert to just varieties or forms of G. schickendantzii.

At this juncture, one is faced with a choice between "G. stuckertii" sensu Backeberg and "G. stuckertii" sensu Frič. At least one is dealing with two clearly separable sub-divisions of the genus, the Ovatisemineae and the Muscosemineae respectively (Schütz 1962). It seems reasonable therefore to expect that reference to the original description of the species would enable the correct choice to be made. Unfortunately this does not appear to be the case. Careful analysis of every feature mentioned by Spegazzini shows an almost equal division between characteristics typical of the Ovatisemineae and the Muscosemineae and almost as many features characteristic of both. One cannot help wondering if this incredibly confusing description was written from memory (not the first instance of this attributed to this particular author) and whether, in fact, it combines features of more than one plant.

Recent investigations, by the present author, of the scanty herbarium material of the genus Gymnocalycium held at the Royal

Botanic Gardens, Kew, revealed a single specimen labelled "G. stuckertii" collected by J. A. Schafer in December 1916 from "sand dunes along the Río Andalgala, Catamarca". Unfortunately there are no flowers, fruits, or seeds and no habitat photographs. If this could be positively identified as either Ovatisemineae or Muscosemineae then this would provide very useful evidence, as Schafer would have identified it solely from Spegazzini and quite unprejudiced by later authors and their varying interpretations of the facts. Further investigation of this material will have to be made. If it can be demonstrated that it is of the G. sutterianum - G. sigelianum complex (Ovatisemineae), then the problem of the identity of G. stuckertii is no nearer solution, as this would merely extend the previously known closely confined distribution of this complex to Catamarca for the first time and still offer a choice between the ideas of Backeberg and Frič. If however it can be shown to be a member of the G. schickendantzii group (Muscosemineae), then Frič's concept of G. stuckertii would be strongly supported.

Another complication is provided by plants collected by Alfred Lau under the number Lau 439 in the Sierra Medina at 1400 m, Northern Argentina, during his collecting trip of 1970/72. They have been distributed under the name of G. stuckertii, but from a photograph of one such plant in an article by Donald (1972) it would appear to be nearer the Ovatisemineae type rather than the Muscosemineae, although it is by no means certain that it belongs to either! This plant is also under further investigation. (See also under G. baldianum).

A number of plants of a quite different kind imported at about the same time as Lau 439 and probably collected by the same person,

species by Spegazzini. However, much will depend on the real identity of Lau 439 and Schafer's plant. If and when this had been established, then the situation must be reviewed.

Whatever the decision arrived at however, it is quite certain, in my opinion, that unless authentic illustrations, or as yet undiscovered contemporary herbarium material come to light, the original Echinocactus stuckertii cannot be adequately defined working only from the description left us by Spegazzini. An element of doubt will inevitably remain.

Description:

This description is based on the original Latin diagnosis and the additional comments, also in Latin, which accompanied it, in Spegazzini (1905). Nothing has been added from later authors, and no alterations made.

Hybocactus. Body of moderate size (60 - 65 mm in diameter, 35 - 40 mm in height) with the torus slightly concavo-umbilicate. General appearance depressed globose, dark green in colour. The apex is tubercled but nearly bare of spines and has sparse, bristly, shortish hair between the tubercles. Closely related to Echinocactus multiflorum Hooker and having the habit of Echinocactus hyptiacanthi Lemaire, (very similar to the illustration in Schumann's Gesamtbeschreibung, p.403, fig.70) but is smaller in size and with the tubercles of the ribs less well developed, and having the central spines always completely absent. Chiefly distinguishable by the most distinctive structure of the petals.

Ribs 9 - 11, wide, blunt, fairly robust, dentate. In their upper portions elevated and acute, lower down towards the base flattened and blunt. They are usually formed from 3 - 5 tubercles, the latter fairly

large and usually with acute humps towards the base.

Areoles slightly greater in length than breadth, 7 - 9 mm long, 4 - 5 mm wide, rather widely separated (10 - 15 mm).

Spines all radial, 7 - 9 in number of which 6 - 8 are arranged horizontally on either side, the remaining one, the lowest, pointing vertically downwards. They are woody, rigid, 10 - 24 mm long, coarsely scaly-dusty, flattened-circular in section, appressed, gently curved backwards, ash grey, becoming darker (alternatively "brownish-grey" G.J.S.) at the tip.

Flowers arise from the edge of the torus, erect, of medium size, scentless, more often solitary, 40 mm in diameter. Externally lacking spines or hair, the flower tube becomes dark bluish-green and bears quite hard scales. The scales are purplish green and quite robust. Outer scales semi-circular with white margins. Scales gradually merging into the petals above which are slightly fleshy. Petals almost spatulate with "long and narrow claws" (emphasised in original text G.J.S.) from white to almost pink in colour. Filaments of the stamens and pollen yellowish, style greenish with 12 white stigma lobes.

Habitat:

In Spegazzini's original publication (1905) the habitat was given as "very dry hills in the provinces of San Luis, Cordoba, Tucuman, and Salta." When Britton & Rose transferred the species to the genus Gymnocalycium (1922) the type locality was given as San Luis Potosi, Argentina. Why this particular province was selected from the previous four is not known, but it may well have been that Spegazzini's photograph, used by Britton & Rose, may have been of a plant collected in that

particular area. They did however give the general distribution of the species as Northern Argentina. Dölz (1957) mentions Catamarca in addition to the four provinces already mentioned, suggesting that Spegazzini himself may have extended the distribution to include this area, but does not quote any documentary evidence for this. However, the herbarium specimen collected by Schafer in 1916 mentioned above, did in fact come from this area, so that Dölz may well have seen this fact somewhere in the earlier literature. Backeberg (1959) repeats only the original distribution given by Spegazzini.

Map references:

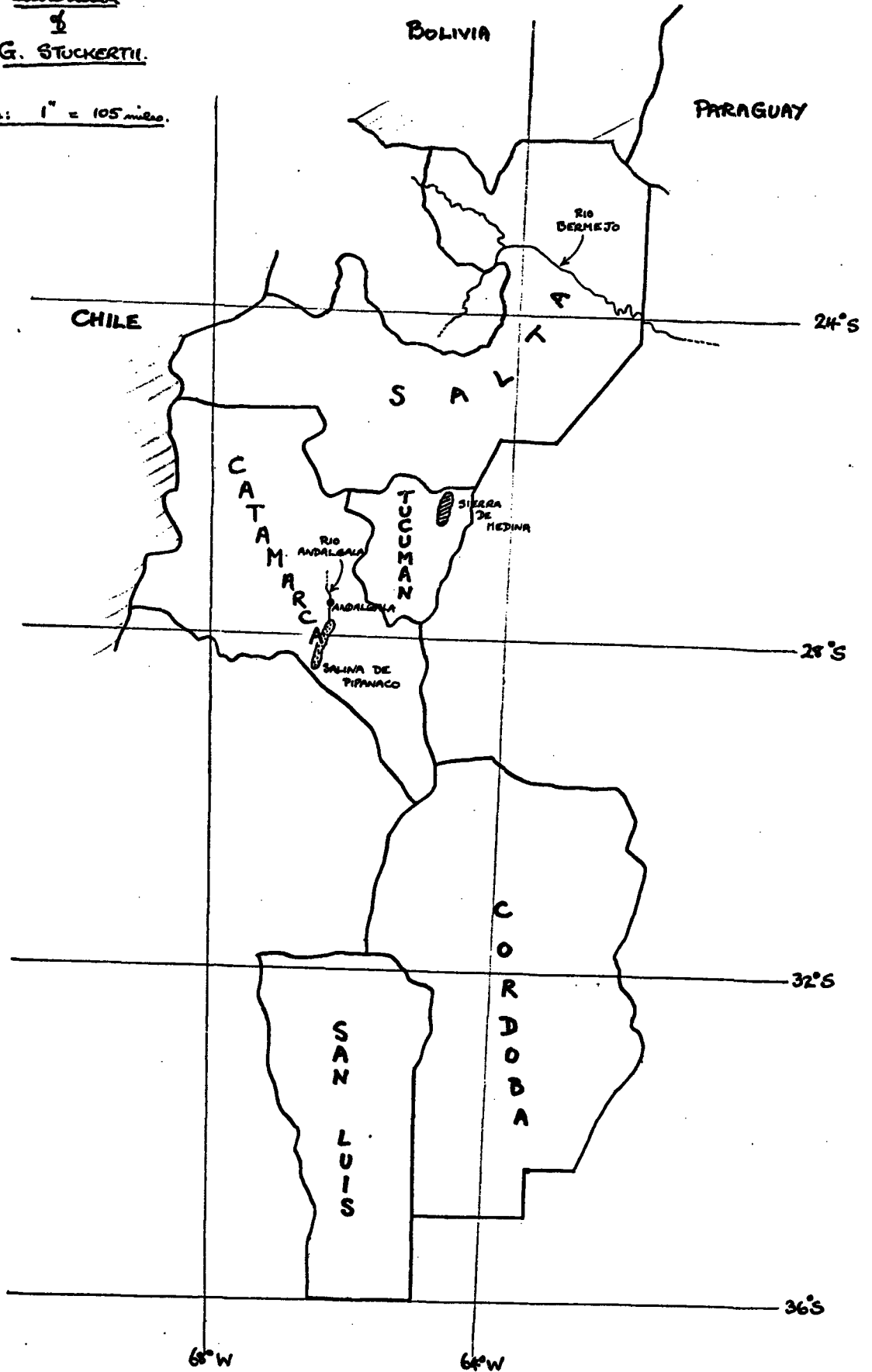
SIERRA MEDINA	65°09'W	26°24'S
RIO BERMEJO	63°42'W	23°23'S
RIO ANDALGALA	69°19'W	27°35'S

Sheets: G19, G20 and F20, ATACAMA, TUCUMAN and RIO PILCOMAYO

North Western Argentina.

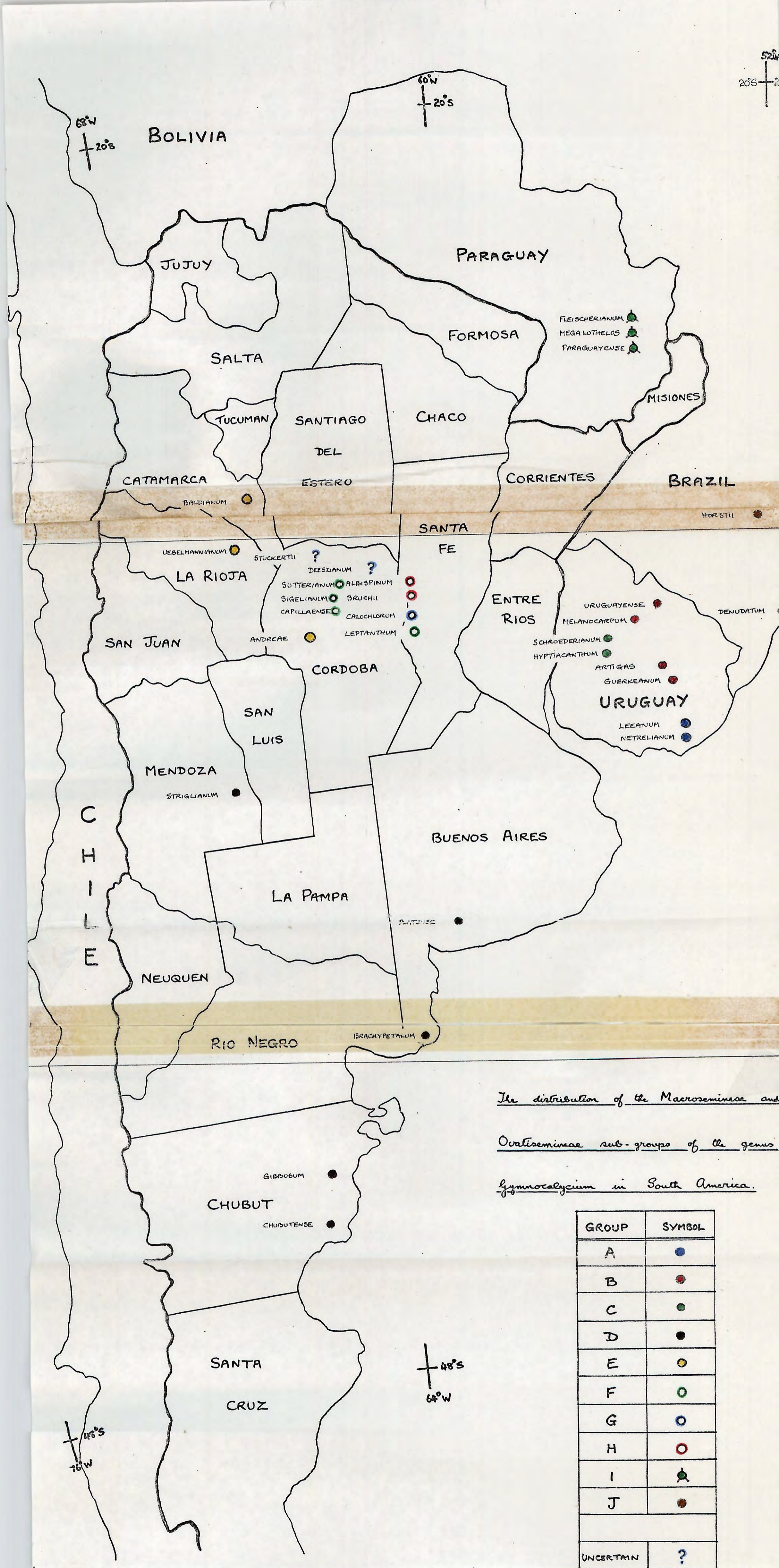
Distribution
of
G. STUCKERTII.

Scale: 1" = 105 miles.



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The distribution of the Macrosermaceae and Ovalisemineae sub-groups of the genus *Gymnocalycium* in South America.

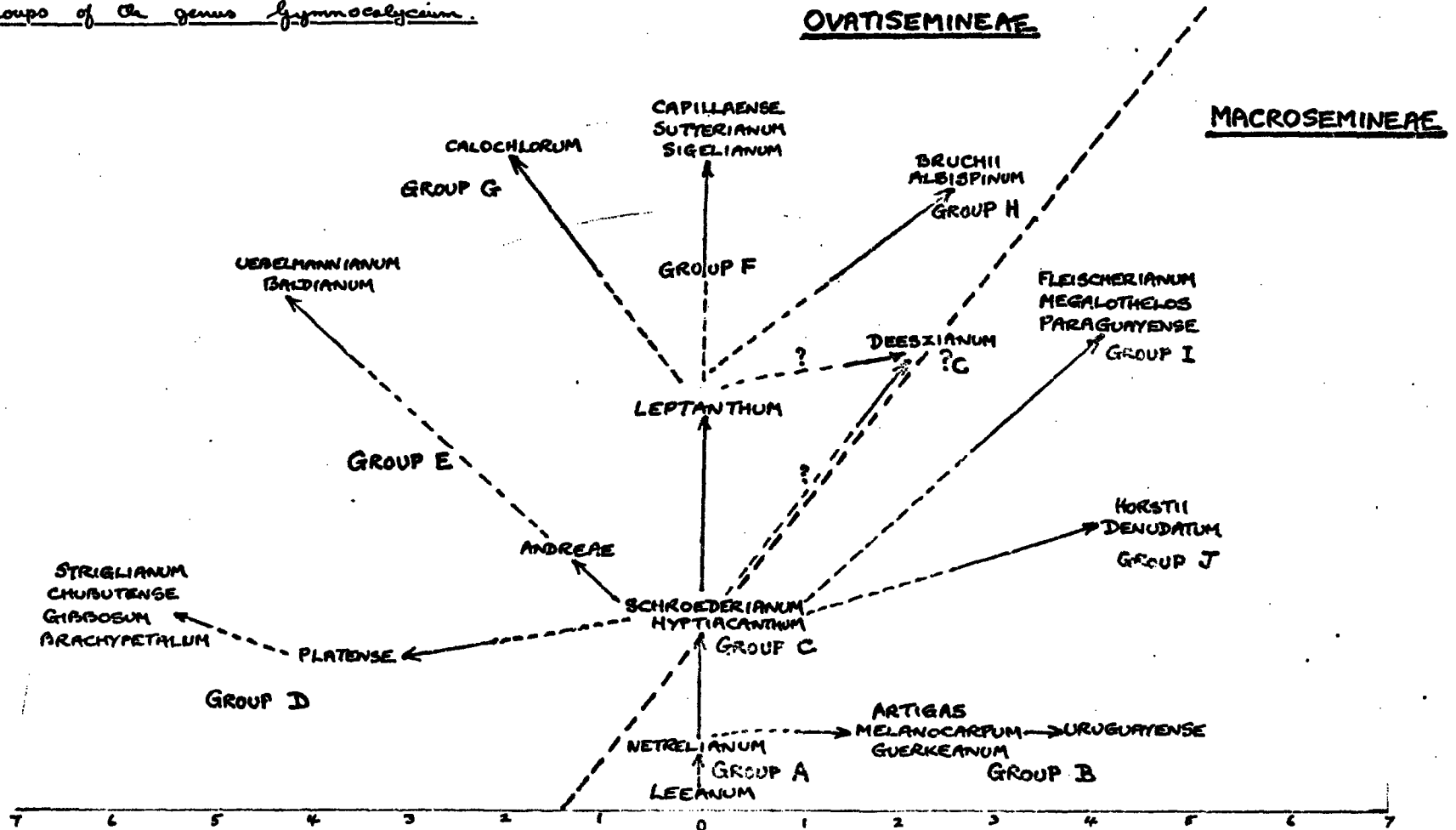
GROUP	SYMBOL
A	● (blue)
B	● (red)
C	● (green)
D	● (black)
E	○ (yellow)
F	○ (green)
G	○ (blue)
H	○ (red)
I	● (green with stem)
J	● (black)
UNCERTAIN	?

CONCLUSION

Having searched the literature relating to all the named members of the two seed groups, Macrosemineae and Ovatisemineae, and extracted what is hoped to be a reasonably accurate description of each as envisaged by the original authors of the species, and in addition, having collected together what habitat information is available for each one, the overall picture must be looked at to see if any kind of pattern emerges. At the same time, one must also utilise previous experience of these plants in cultivation and the information derived from a preliminary study of the seeds of these species, although it must be stressed that at present this last study is far from complete having been put on one side when it became obvious that a literature survey was an essential prerequisite for any productive study of the living plants.

The first point to emerge is that two separate seed groups are very difficult to sustain. It would appear that both G. schroederianum (which is probably very close to if not identical with G. hyptiacanthum) and G. deeszianum are intermediate with regard to seed shape between the Macrosemineae and Ovatisemineae as usually defined. Once the boundaries between the two groups have become blurred, preconceived ideas must be abandoned and common features and trends can be looked for within the combined groups. Taking the seed of G. schroederianum as a starting point, it seems feasible that the G. denudatum type could well be derived by increase in size and a relative enlargement of the hilum. Similarly, a reduction in size of the seed and a relative reduction of the hilum could lead from the G. schroederianum type to the basic Ovatisemineae type.

An attempt to show the relative degrees of affinity and possible inter-relationships of the combined Macrosemineae & Ovatisemineae seed groups of the genus Gymnococcium.



Yet another line could lead from G. schroederianum towards the larger and characteristically different seeds of the Paraguayan group.

G. schroederianum is not, however, the basic type of the whole group, but was merely the starting point from which ideas regarding relationships were developed. The more primitive members of the group, with their very large seeds and yellow flowers, such as G. leeanum, must presumably have given rise to G. schroederianum types in the first place and this latter plant would appear to be near the point where a number of divergent lines of evolution originated.

Taking an overall view of the genus, however, there remain many problems concerning relationships between the Macro-Ovatisemineae group and the remaining three seed groups. The Microsemineae are very varied in the appearance of the seeds and links between at least some of them and the Macro-Ovatisemineae seem feasible. However, when the Muscosemineae and Trichomosemineae are considered, there seem to be no possible links between the two groups themselves or with the other seed groups. If it is assumed that the genus Gymnocalycium is a natural unit (and this must not be accepted too readily), the intermediate forms must have been lost, and of necessity, the links must be looked for in features other than in the form of the seed. It remains to be seen whether such links can be established. If not, the genus must be regarded as something other than a natural grouping and immediately it becomes necessary to consider not only plants in the genus as at present constituted but also such genera as Weingartia and Neowerdermannia as suggested by Hunt (1967).

On the basis of seed shape alone, the relationship framework of the Macro-Ovatisemineae group would be flimsy indeed, but evidence in support from other sources can be offered. Geographically speaking,

the suggested lines of development make sense in so far as they radiate from the southern region of Uruguay and the resultant sub-groups are geographically well defined and for the most part distinct.

Flower colour too, fits the suggested pattern reasonably well. Starting with the yellow of G. leeanum, the predominant colour becomes greenish-white in G. schroederianum, white or pink in the G. denudatum line, white with an occasional tinge of pink in the G. gibbosum group while the G. baldianum group shows white, red and yellow. The G. capillaense group have white or pinkish white flowers as have the rest of the species under consideration with the exception of G. bruchii and G. calochlorum whose flowers are pink. G. uruguayense appears to have yellow, white and pinkish-lilac flowers but even so, fits quite well into the general pattern if it is regarded as the most advanced member of the central Uruguayan group.

A red throat to the flower appears to be a characteristic feature mainly of the northern and western representatives of the group as a whole, starting once again with G. schroederianum and including G. platense and G. brachypetalum to the south, G. leptanthum (at least according to Backeberg) and G. uebelmannianum, all the Cordoban species except G. bruchii, and G. fleischerianum and G. paraguayense amongst the Paraguayan group. If the relationship pattern suggested is correct, it would seem that G. gibbosum, G. chubutense, and G. striglianum have lost the red throat as they spread away from their origin in Uruguay. G. bruchii differs from its nearer neighbours in Cordoba not only in lacking a red-throated flower, but in a number of other respects, such as its "cushion" habit, and this could well be due to its being a high altitude plant.

In these last two cases, due to altitude in one, and geographical separation in the other, the insect pollinators available to the plants could well be very different, resulting in changes in the colour pattern of the flowers. Little information regarding insect visitors to the flowers of the genus Gymnocalycium is available but according to Porsch (1938/39) they are usually bees. G. bruchii is mentioned as having several kinds of insect visitors such as flies, and two kinds of wasp in addition to bees, but no references have been found to the G. gibbosum group of plants. Flowers with a purplish-red throat would certainly be attractive to bees, but in the absence of such colour, either other attractants or other insects would be necessary. Some, if not all, plants of G. bruchii have quite strongly scented flowers, varying from Carnation to Beetroot, so this may be the answer in the case of this species. The flowers of the G. gibbosum group of plants do not appear to be scented, so that in their case the problem remains unresolved. It is worth noting that in addition, none of the plants concerned appear to be self-fertile; indeed, some plants of G. bruchii have been seen to be dioecious.

The absence of the red throat in the case of G. megalothelos is much harder to account for but the plant is not at all well known and could well be misplaced in the group with G. fleischerianum and G. paraguayense.

Although the presence of numerous heavy spines on a particular plant can obviously serve a protective function, and a dense hair-like spination can possibly prevent scorching of the plant by intense sunlight at high altitudes, or in other circumstances may provide an insulating layer against excessive cold, the actual colours of the spines would

Paraguayan group, information is incomplete, though G. megalothelos is said to have yellowish spines becoming horn-coloured with age and G. fleischerianum is known to have orange to brown spines which later become grey. In fact, the majority of spines tend towards grey with age and when colours are mentioned it is usually with reference to the current year's areoles near the crown of the plant. G. denudatum and G. horstii both have yellowish spines becoming paler with age and completely lacking brown bases.

In the majority of cases it would seem that differences in depth of colour of the spines are due to a roughening of the spine surface, producing a scaly appearance. This textured surface scatters light falling upon it and the colour appears pale. The grey appearance of most old spines is in part due to fading of the colour in strong sunlight, but very largely due to the increasing roughness of the spine surface. Tips of spines, for example, are often darker because the scales are not developed to the extreme tip. Spraying the spines with water usually produces quite marked colour changes, the liquid cancelling out the scattering effect of the scales until such time as the surface is dry once more, when the greyish appearance returns. Scanning electron microscopy is ideal in the context of spine studies and could well reveal differences in detail of surface texture which could be of great use in taxonomic work. Some general work of this nature has already been undertaken by Schill, Barthlott and Ehler at Heidelberg (1973a). Even observations with a hand-lens however, can reveal gross morphological differences and within the Macro/Ovatisemineae group, some plants, at least, appear to have somewhat flattened and grooved spines, though the majority have spines whose cross-section is

and while in habitat it could possibly be of use in identification, plants in cultivation in Europe do not always develop this feature to the same extent as the same species under natural conditions, and one must therefore be cautious in its use as a diagnostic feature. The nature of the epidermis itself, however, when studied at a moderate magnification under the scanning electron microscope may well prove to be useful from the taxonomic point of view. For example, Schill, Barthlott, Ehler and Rauh (1973b), having studied the epidermal features of about 40 species of Cacti, were certainly of this opinion.

Within the G. leeanum and G. guerkeanum groups, red or pink buds seem to be the norm (at least in the early stages of development). This feature is also most striking in G. fleischerianum while the buds of G. paraguayense are described as reddish-brown, and those of G. schroederianum are also brownish. Elsewhere in the group as a whole, although to some extent the buds normally contain some pigments in addition to chlorophyll, the distinctive bud colouration of the more primitive members seems to have been lost.

So far, flower structure has not been studied in any detail in this group but superficial observations lead one to believe that a comparison of flower sections may possibly reveal significant differences. One feature of the yellow flowered Uruguayan members of this group, however, which is immediately obvious is that many of them produce unisexual flowers. It has also been observed that G. bruchii can also exhibit this feature, at least in cultivation in European greenhouses. Habitat observations would be required to confirm this in the wild, for the facility with which this plant can be vegetatively propagated would

make it an easy matter for an aberrant plant in a commercial greenhouse to give rise to a large cultivated population in quite a short space of time, thus distorting the true picture of the occurrence of unisexual flowers in this species.

The form of the plant body in the group under discussion is essentially globular and there is little significant variation between one species and another except in the presence or absence of ribs. It is really a matter of personal opinion as to when exactly a row of tubercles becomes a rib, but in some plants at least, there appear to be no ribs or rows of tubercles. Hooker (1845), describing E. leeanus, specifically mentions that the tubercles on his plant are "... not arranged in distinct lines or series so as to form ridges with their corresponding furrows, but placed with a good deal of irregularity ...". This has been observed by the present author, to varying degrees, in specimens of G. platense, G. leptanthum and G. schroederianum and one would expect to see it in G. hyptiacanthum, if indeed this plant exists as a separate entity from G. schroederianum. This feature is presumably a relatively primitive one and is not clearly shown by those plants near the origins of the postulated lines of development. (See diagram).

While it has been suggested that a number of evolutionary lines may have radiated out from the common ancestor situated somewhere in southern Uruguay, it must be kept in mind that this could well be an over-simplification. Very few chromosome counts have been published for the genus Gymnocalycium, but where available they seem to be mainly $2n = 22$. This similarity in chromosome number could in part account for the readiness with which species in this genus form hybrids under

greenhouse conditions. Whether or not they are able so to do in habitat is questionable owing to the wide distribution of the plants and their frequent isolation in small groups, e.g. on hill-tops apparently separated by valleys where for various reasons the plants are unable to grow. On the other hand, this isolation may be of a relatively recent date in evolutionary terms and thus constitutes an invalid objection to the idea of natural hybrids occurring in habitat. If such hybridization does in fact occur within the genus, then a reticulate pattern of evolutionary lines should replace the simple linear version suggested. Friedrich (1974) has suggested that this phenomenon could well be the answer to a number of taxonomic problems within the Cactaceae and it might equally well apply in the genus Gymnocalycium. A number of the so-called species do seem to be extremely variable and yet cannot easily be separated into discrete groups. These could well be hybrid swarms which are still in the process of speciation but have not yet reached the stage where the taxonomist may detect "good" species from amongst them.

In conclusion, it must be repeated that this hypothetical pattern of relationships, linear or reticulate, is based on descriptions of plants, often over a century old, incomplete, sometimes contradictory, and in many cases prior to the advent of the camera. The majority pre-date colour photography. Cacti are plants of virtually no economic value whatsoever and thus they have been, and still are, largely neglected by the professional botanist, leaving the field mainly to the sometimes excessively enthusiastic amateur collector, of limited means and even more limited field experience. Consequently, the literature and illustrations that do exist must often be treated with caution.

The present author's observations unfortunately have also of necessity been based on cultivated plants in his own and other enthusiasts' small collections, although priority has always been given to plants imported from habitat and/or seedlings grown from collected material. Herbarium material is also conspicuous by its almost complete absence, Kew Herbarium and the Natural History Museum, South Kensington possessing less than ten sheets between them, only two being anywhere near complete, and none showing any fruits or seeds.

However, in spite of the somewhat unreliable nature of the information available, unless an attempt is made to interpret and collate this information and to construct a possible pattern of relationships, one is overwhelmed by a wealth of apparently unconnected detail to which more and more is added as the years go by, with little progress being achieved in our understanding of the group as a whole. So often in the past, the issue has been avoided and new information merely recorded but not assessed and integrated into the existing body of knowledge. This is shown only too clearly by the way in which workers have often created new species on the basis of a few minor differences instead of trying to find similarities whereby the variant may be fitted into the existing groupings of known plants. It has therefore been the aim in this study to organise a somewhat more coherent group of facts about what appears to be a fairly natural group of plants within the genus Gymnocalycium, and to provide the basis for further integrative studies which must now centre on the living plants themselves.

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EPILOGUE

"... as I am well aware of my limitations, I have no doubt that in places mistakes occur, and, even though the work has been frequently revised, further corrections may well be needed. But if you will be tolerant, and look with a kindly eye on my undertaking, and regard my efforts as in some degree successful, you will encourage me to still greater effort, and I promise that I will be more careful in future not to submit to your judgement and the censure of the public anything that has not been subjected to the most careful and prolonged revision ..."

John Ray: *Catalogus Plantarum circa
Cantabrigiam nascentium*. 1660
(Ewen & Prime's Translation, 1975)

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