cactusinhabitat

South America 2005/2010

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00. Introduction

The cactusinhabitat booklet is due to the need for a printed and electronic publication, to summarize and complete the major contents of the website cactusinhabitat.org, a project that is exclusively devoted to the study of cacti in their habitat. The site, at its first release (october 2010), features over 2000 photos from our archives, to which we will refer when necessary in the booklet. It results from the research and reflections of the last five years, half of which spent in South America. The observation of the species in habitat led us to the need for a more simple classification, because either Backeberg, Ritter & Co.'s, or the International Cactaceae Systematics Group's taxonomic interpretation, cannot fully clarify the relationship between the species. We cover this subject in chapter 1, *A taxonomic approach for a simpler (and more stable) classification of genera and species in the cactus family*. Then we explain the lines we followed in treating infraspecific taxa, and we describe our more traditional approach, in terms of taxa removed from the species level, compared to the ICSG's approach. In-depth comments on some species follow: an article about the correct name of the *Discocactus* living in Grão Mogol; or on the new distribution to assign to *Parodia claviceps* (F. Ritter) F. H. Brandt and *Parodia schumanniana* (K. Schumann) F. H. Brandt, etc. Up to now, the site takes into consideration 40 genera and 151 species (of which 32 of the genus *Parodia*). Three combinations are published here for the first time in chapter 4, *New combinations in various South American genera*. The last comments are devoted to the problem of conservation and to our contribution to this delicate and constantly evolving subject. The booklet will follow the site updates with the geographic, conservative and taxonomic novelties which will be highlighted by our surveys of the next journeys.

Giovanna Anceschi & Alberto Magli

01. Taxonomy

A taxonomic approach for a simpler (and more stable) classification of genera and species of the cactus family

The names of plants

We here indicate the guidelines adopted by cactusinhabitat.org, regarding the names to be given to plants; this is a controversial argument that is being disputed by different schools, and that basically gave birth to two positions: that of the “splitters” (those who divide, and mainly capture differences), and that of the “lumpers” (those who merge, and mainly capture similarities). Similar problems certainly do not occur only in the cactus world, but they concern every community of specialists that are devoted to the classification of living organisms. The taxonomic categories (taxa) of the Linnaean classification system (1753) that are covered here, are the genus and the species, ie the categories that formally identify the name of the plant, and that are also, for this reason, the most subject to nomenclature changes.

The concept of species

While the genus is the taxonomic category that includes similar species, and that should by its nature include as many species as possible, since Linnaeus times, the species have represented the minimal unit of taxonomic classification. But until now, nobody has been able to clearly define what it consists of. Darwin (1872 / It. Ed. 1967, 548, 549) was convinced that one day the systematics would no longer be haunted by the doubt if this or that form were true species, and that they would eventually get rid of the useless discussion about the meaning of the term. Far from all this, over time a more strictly morphological definition (which summed up in the same species groups of individuals that showed common morphological features, though without specific indications about their number and nature) developed into the definition that is known as biological species concept, defined by the famous German ornithologist Ernst Mayr:

“Species are groups of actually or potencially interbreeding natural populations, which are reproductively isolated from other such groups” (1942, 120). Note that Mayr does not provide information about the appearance of these populations. Lately, the most accepted approach is basically a mixture of the two methods, that regarding cacti is expressed by David Hunt as follows: “A series of similar intergrading and interfertil populations, recognizably distinct from other such series and reproductively isolated from other such series” (Hunt *et al.* 2006, text: 4). We emphasize that the potential expressed in Mayr’s definition does not appear in Hunt’s definition, who nevertheless proceeds to say that, in theory, populations in question are genetically able to interbreed, but this does not happen, due to isolation caused by geographic or ecological barriers.

Genera and species in the Cactaceae

Since the late Nineteenth century, specialists have developed several trends regarding the number of genera and species to be recognized in cacti. The first important monograph on the family is *Gesamtbeschreibung der Kakteen (Monografia Cactacearum)* by Karl Schumann (1897-99), in which the author recognizes 21 genera. Later, in the 1920s, the two American botanists Nathaniel Lord Britton & Joseph Nelson Rose, who are considered to be the first splitters in the history of these plants, in their four volumes *The Cactaceae* (1919-23) divide the 21 Schumann’s genera of into 124. This trend towards the fragmentation of the family into a greater number of genera and species is even more evident in the four volumes work by the German Friedrich Ritter, *Kakteen in Sudamerika* (1979-81), which only concerns the South American cacti; it reaches its climax in the work of the compatriot Curt Backeberg, who in *Kakteen Lexicon* (1966), identified 233 genera. In the late 1980s, a group of international experts, born as IOS Cacataceae Working Party from the Cactaceae’s section of the International Organization for Succulent Plant Study, aimed at a more traditional taxonomic approach. The search for a new consensus on the cacti genera and its progress were published by two members of the group, David Hunt & Nigel Taylor, in *Bradleya* (1986, 4: 65-78; 1990, 8: 85-107). In 2000 the group was renamed International Cactaceae Systematics Group (ICSG) (Hunt 2000, 9: 1). Another member of the ICSG, Ted Anderson, published his monograph *The Cactus Family* (2001) which recognizes 125 genera and 1810 taxa, including species and subspecies. However, the work that represents the result of ICSG joint efforts, that is probably the most up to now comprehensive monograph on the cactus family, is *The New Cactus Lexicon* (Hunt *et al.* 2006), in two volumes, where the authors display their vision of 124 genera (the same number of Britton & Rose), and 1816 between species (1438) and heterotypic subspecies (378) (Hunt *et al*. 2006, text: 5).

A more traditional approach

What does the more traditional ICSG (the lumpers) approach consist of, compared to Backeberg, Ritter and their successors (the splitters)? What are the differences between the two schools, and what is our position? The first difference is organizational; while the works by Backeberg and Ritter resulted from individual researches and studies, ICSG works are due to the collaboration of a group. At generic and specific levels, the biggest changes proposed by the new school are generally given by the evidence emerged from molecular studies conducted in recent decades. At infraspecific level, their novelty, justified by greater taxonomic effectiveness, consists of replacing the category of variety that was widely used in the past, with the category of subspecies. Concerning genera, the gap between the two schools comes from putting together some series of ex-genera (that enthusiasts and collectors really love) into a few macro-genera. Some examples: *Echinopsis* Zuccarini now includes *Acanthocalycium* Backeberg, *Chamaecereus* Britton & Rose, *Helianthocereus* Backeberg, *Lobivia* Britton & Rose, *Pseudolobivia* Backeberg, *Setiechinopsis* (Backeberg) De Haas, *Soherensia* Backeberg and *Trichocereus* Riccobono. *Eriosyce* Philippi, in Fred Kattermann's (1994) revision and amplification, now includes *Horridocactus* Backeberg, *Islaya* Backeberg, *Neoporteria* Britton & Rose, *Pyrrhocactus* (Berger) A. Berger, *Thelocephala* Y. Itõ. And especially *Parodia* Spegazzini, in one of the options proposed by Reto Nyffeler for the genus (1999, 7: 6-8), now comprises *Brasilicactus* Backeberg, *Brasilparodia* F.Ritter, *Eriocactus* Backeberg, *Notocactus* (K. Schumann) Frič, and *Wigginsia* D. M. Porter. Here the supporters of *Notocactus* (including the other segregate) as separate from *Parodia*, basing essentially on the morphological diversity of seeds (Glaetzle & Prestlé 1986, 4: 79-96), are far from surrendering. On species regards, Backeberg & C. coined many superfluous names, that are now correctly listed as synonyms. This is in our opinion due to the fact that many researchers in the past (except Ritter) did not devote enough time to study the plants in their places of origin, often taking the different evolutionary phases of the same taxon for new taxa, thus “discovering” the same plant several times (see *Parodia mueller-melchersii* page 26-28). Another reason is the desire to give new discoveries to the enthusiasts‘ world, preferring, for this purpose, to capture every minimal difference rather than the similarities. Furthermore, in our experience, the populations that make up a species in habitat show a variability that, while in nature is linked by a space continuum, in cultivation appears artificially fragmented, generating some unnecessary distinctions. In agreement with Ritter, in a letter written to Krainz on April 25th, 1955 (Leuenberger 1996), we believe that whenever the classification of cacti is possible, this must be done only through careful studies in the places of origin; because, we insist, the observations made on plants in cultivation (although by certified field numbers) may often result misleading.

Variety or subspecies?

As we have just mentioned, one of the changes proposed by the ICSG is the replacement of variety with subspecies, which thus became the only formal category recognized at infraspecific level. The decision was taken during a workshop that was held during a meeting of the group in 1994, whose summary is given by Hunt in *Cactaceae Consensus Initiatives* (1999d, 8: 23-28). In point number 15, it should be noted how the discussion emphasizes that the choice between variety and subspecies does not involve the concept that the category implies, but rather the nomenclature consequences that this choice entails. In point number 17, Taylor says that subspecies, having been less used, would make the authors’ work quicker and more free. In point number 19, Taylor’s arguments are accepted, and the category of subspecies is confirmed. Only later, that choice would also be substantiated by a meaning similar to the idea that, since Darwin’s times, we have of the term subspecies, namely that of geographical race, or in Hunt's words: "for significant variants, especially those which represent groups of population occupying more or less discrete areas within the overall range of a species" (Hunt *et al.* 2006, text: 4).

From the confusion of varieties to the one of subspecies

If it is true that Backeberg & C. were responsible for many unnecessary names, the fact remains that the lumpers are currently responsible for some questionable nomenclature changes. For example, as Rob Bregman pointed out (2002, 13: 18-20), in his aforementioned revision and extension work of *Eriosyce*, Kattemann (1994) maintained, for the most part, the old generic names like *Pyrrhocactus*, *Islaya*, *Neoporteria*, etc. simply lowering them in rank, and recognizing them as infra-generic groups of *Eriosyce*. The case reported by Bregman is representative of a mode that does not convince us. If we really think that *Pyrrhocactus* (Berger) A. Berger, and other ex genera, are not distinct from *Eriosyce* Philippi, then why distinguish it as an infra-generic level, creating more unnecessary taxa? For this reason, although we accept *Eriosyce* Philippi sensu lato (as for *Echinopsis* Zuccarini and *Parodia* Spegazzini sensu lato), because this interpretation, in the cases mentioned, is closer to what we found in nature, we consider the infrageneric distinctions to be misleading. Having to express an opinion, we now turn to the dispute on the use of variety or subspecies. According to Detlev Metzing (in Hunt 1999d, 8: 26), we would have thought that the choice of variety, being more used with cacti, would probably cause less nomenclature changes. But the observation of species in their habitats led us to conclude that none of the two categories is needed to better understand the evolution of a natural species. We are not saying that in the range of one single species, populations with distinct morphological and geographical characteristics are not distinguishable. We'd rather say that this variability is closer to the idea of species that is obtained by observing the populations in habitats; and in order to indicate these minor variants, the use of the term form (without taxonomic value) seems more appropriate. We still consider Linnaeus's opinion to be very modern, when he says that the botanist should not take into account these slight variations. We think that still today the minimal unit of measure in the classification should be the species, and that each additional category below this rank is confusing, rather than simplifying. Unfortunately, in some cases, we suspect that the only reason that could justify the use of a formal infra-specific category is the desire to sign the so obtained “new taxa”.

A wide-mesh sieve

We believe that nature and evolution essentially follow simple laws; therefore, the easier it is to describe the processes that take place there, the easier they will be understandable. We also agree with Hunt (1999d, 8: 24) that the primary goal of the names, even before classifying, is to identify; therefore, it is necessary that names are the result of simple definitions. Why use a trinomial system if the binomial is sufficient to express the diversity that exists in nature? Perhaps the concept of species, as it is generally used, is too restrictive to describe reality. If we really need to reach a more stable classification, in which the taxa are not at the mercy of doubt, for example regarding the identity of the pollinator (see *Pilosocereus minensis* page 31), we must broaden the range of the characters capable of defining the boundaries of a natural species. Or, so to speak, we should use a wide-mesh sieve for this filtering operation, in order to avoid the complications that occur when using a closer one. This allows us to better define the really distinct entities in nature as species, without the need to recognize further subdivisions as a lower rank.

The identification characters of species

But which, and how many, are the characters that the taxonomists considered, in order to assign the rank of species? And which are the most important? In the mid-Eighteenth century, Linnaeus built his classification system that is still in use today, believing in a static world, where God created all species in a single solution. Species, therefore, were different or similar to each other, because of purely morphological characteristics. Over a century later, Darwin (1872), with his theory of evolution where, on the contrary, species are constantly fluctuating, shifted the attention to the fact that the close similarity between species is due to common ancestry. Thus, morphological characters are important in classification only because they reveal ancestry. It follows that the hierarchical arrangement of groups inside other groups created by Linnaeus must be a genealogical arrangement according to Darwin (1872 / It. Ed. 1967, 483, 488, 492-493). This idea about the genealogy of life is the basis for modern taxonomy or natural classification. Darwin certainly gave a direction to the taxonomists, without indicating them how to move, but we will return to this point later. In the field of cacti, and in view of a natural classification, important studies on morphology, with particular attention to flowers and seeds, were conducted by the Austrian botanist Franz Buxbaum (1950; 1957-1960). Then, among all the morphological elements (stem, ribs, areoles, leaves, spines, roots, flowers, fruits and seeds), particular attention was paid to the study of seeds (Barthlott & Voit 1979; Barthlott & Hunt 2000; Stuppy 2002) because it was assumed that their characters were more stable and less susceptible to environmental factors (Anderson 2001, 34). Later on, Gyldorro (2002, 14: 27) stressed that in mixing and remixing the dominant genes, similar appearances may result as final products of distinct lineages; so he considers senseless to use the character of seeds as more reliable to define the genera, and we add, the species. As Roy Mottram stated: “Seed-types are subject to convergences like any other characters…” (in Hunt & Taylor 1990, 8: 102). After the seeds, the last frontier investigated to find the fundamental character for defining species (and any other taxa above this), is the use of molecular variations. This involves the application of the molecular systematics techniques (DNA sequences) to infer relationships, almost completely avoiding the similarity due to parallel evolution, because the molecular characteristics are not subject to the same external forces to which the morphology of organisms is subject (1995 Wallace, 13: 2). The molecular data that are collected can easily be interpreted by the cladistics methods, ie through cladograms, that are schemes of evolutionary trees, on which the links between different lineages (taxa) under study appear. Let’s step back and say a few words about the work by the father of cladistics, the German Willi Hennig (1950; 1966), whose first publication, that is now considered irreplaceable, was virtually unnoticed. As Gordon Rowley states: “No taxonomic revision is considered complete without a cladogram…” (1997, 4: 13). In a nutshell, the main points of Hennig’s thesis can be summarized as follows: a) To identify groups of evolutionary relatives, only shared evolutionary novelties should be used. b) Only those that included all the descendants of an ancestor may be recognized as evolutionary relative groups (or clades). Hennig called monophyletic or olophyletic, a taxon (category) that includes all members of a clade (evolutionary branch); while paraphyletic is a taxon that does not include all the members of a clade; and polyphyletic is a taxon that includes different clades. It is clear that only monophyletic taxa can be defined as natural groups. These methods seem eventually to be coming to the rescue of the genealogical vision that in Darwin’s thought the modern taxonomy should follow. But can we consider the molecular data, and their interpretation in cladograms, as “The Data” that tip the balance in one or the other direction to define a species, a genus, or any other taxonomic category? And more, are we sure that taxonomy should correspond to phylogenetic criteria? Regarding the first question, it should be noted that the molecular data is currently almost exclusively investigated, either when the previously developed hypothesis, basing on the morphological evidence of the phenotype, leads to doubtful conclusions (suspecting possible convergent evolution), or simply to confirm already acquired morphological data. If a comprehensive study of all possible relationships between the taxa that make up the family seems impossible, it is clear that this use of molecular data can lead to very subjective conclusions. Moreover, it is not uncommon that (Rowley 1997, 4: 14) cladograms obtained with slightly different character sets, either with the same sets of characters encoded with a different method, or with the same sets of characters and the same method but with a different interpretation; all lead to different views of the story of a group of taxa, as it happened with the fission or the fusion of the genus *Opuntia* Miller segregate (Hunt 2007, 22: 7). When the evidence of molecular data does not support the perception of our senses, and it does not support our beliefs, it is said that the matter requires further study. Or, as it happened for example with *Echinocactus grusonii* Hildmann, such data were simply ignored, in order to continue considering it an *Echinocactus* Link & Otto (as it is commonly accepted). Indeed, to be monophyletic, *Echinocactus* should include *Astrophytum* Lemaire (Wallace 1995, 13: 7-8); since *Astrophytum* is easily distinguished, it is preferred not to proceed in this direction and to accept a paraphyletic genus *Echinocactus*, which, however, according to Hennig's method, is not a natural group. Moreover, *E. grusonii* would always seem closer to *Ferocactus* Britton & Rose than other species of *Echinocactus* (Butterworth & Wallace 1999, 8: 7). An opposite case is that of *Echinomastus* Britton & Rose, that is recognized as monophyletic on the basis of molecular evidence (Porter 1999, 7: 5-6), and assimilated by the ICSG in *Sclerocactus* Britton & Rose (Hunt *et al.* 2006, text: 259). We are not expressing an opinion on the effectiveness of the decisions that were taken, but we emphasize that it seems to us more appropriate to coherently follow the choices made. Either Hennig's methods are followed, or the molecular-cladistic datum is to be considered as one of the many morphological or physiological data that contribute to define a taxon. This could approximate the cladistics to objectivity, which is too often replaced by abstract solutions, sometimes hybridizing the use and the results. In agreement with the basic idea that was expressed by Darwin (1872 / Ed. It. 1967, 485), and by others after him, we believe that the classification should take into account all the characters, gathering as many data as possible, without giving prevalence to any of them. For any school of thought, it is important a clear approach, supported by a method as coherent as possible, that does not change depending on the needs. Let's take one example amongst many other. The different flower color in populations that constitute one species (even if related to a geographical location inside its range) cannot represent the distinctive element to recognize other taxa besides the species in question: this happens with *Parodia werneri* Hofacker and *Parodia werneri* ssp. *pleiocephala* (N. Gerloff & Königs) Hofacker, which are now treated as synonyms in *Parodia cressigibba* (F: Ritter) N. P. Taylor (Hunt *et al.* 2006, atlas: 310, tab. 310. 6, 311, tab. 311.1, 311.2). We so far agree, but we do not understand how, in a similar case, could the different flower color and the northern distribution of the species make the *Ferocactus covillei* Britton & Rose a distinct taxon, even if at the level of subspecies, as it happens with *Ferocactus emoryi* ssp. *covillei* Hunt & Dimmitt with respect to *Ferocactus emoryi* (Engelmann) Orcutt (Hunt & Dimmitt 2005, 20:16; Hunt 2005, 20: 27, 29, tab. 4-7; Hunt *et al.* 2006, text: 120; atlas: 377, tab. 377.4, 377.5, 378, tab. 378.1). To answer the second question, namely if taxonomy must correspond to phylogenetic criteria, we would say that on one hand we are aware that the species are in transformation, and we agree with Darwin's genealogical vision of the taxonomy following Hennig's methods, but on the other hand we realize that we still use Linnaeus's hierarchical classification system. Now, how is it possible that perpetually fluctuating elements, the species revealed by the evolution theory, are classified into Linnaeus's static categories? The reason is simple: the process of speciation as we all know is very slow; its evolution is not perceived by our senses and the time required is not measurable in terms of human lives. So, regardless of the natural evolutionary vision of the idea of species, what we every day perceive with our senses (our *humwelt*) is actually the same static idea of species that was in front of Linnaeus's eyes. That is why his system is still unsurpassed: it corresponds to the only possible way that we have to perceive the world around us.

Summary and conclusions

- The taxonomical categories with which we are dealing with are the genus and the species.
- The genus, by its nature, should include as many species as possible.
- With regard to the guidelines on genera expressed by the ICSG (Hunt *et al.* 2006, Atlas: X-XI), if we accept *Echinopsis* Zuccarini sensu lato, *Eriosyce* Philippi sensu lato and *Parodia* Spegazzini sensu lato, in agreement with Braun (in Hunt & Taylor 1990, 8: 99) and Braun & Estevez (2001, 3: 104-106, 160-162), we cannot allow *Cipocereus* Ritter to be distinct from *Pilosocereus* Byles & Rowley; moreover, we believe that *Weingartia* Werdermann is a genus in itself, as in Donald (1979, 3: 87-139); it is therefore distinct from *Rebutia* K. Schumann.
- We consider misleading the use of infrageneric categories.
- The classification unit of measurement should be the species.
- There is no need for infraspecific categories (variety or subspecies) to better understand a natural species.
- The minor variants, that show some morphological and geographical distinctions

within the range of a species, are best defined by the term form, without giving to this a taxonomic value.

- The variety observed in nature is thoroughly defined by Linnaeus's binomial system genus-species (1753).
- The use of a wide-mesh sieve, which foresees the enlargement of the range of characters that constitute a natural species, allows us to reach a simpler and more stable taxonomy, less subject to nomenclature changes.
- To define a species, there are no more or less important characters; every character, from the characteristics of the stem, to those of the flower and seed, and finally to the data of molecular composition, equally contribute to the assignment.
- If we opt for a cladistic vision of taxonomy, Hennig's methods must be respected, even when its results do not agree with what is perceived by the senses.
- The results obtained using phylogenetic criteria to achieve a genealogical classification according to Darwin, or a natural classification according to Hennig, often coincide with what is often experienced by our senses, namely the Linnaean vision of the world, and represent one of the possible interpretations (now the most used) for the classification of living beings.
- In view of a more traditional approach, we believe that the number of cacti species in habitat is probably less than the number proposed by the ICSG in *The New Cactus Lexicon* (Hunt *et al.* 2006, text: 5); consisting of 1816 taxa between species and heterotypic subspecies.

02. Notes on classification

Treatment of infraspecific taxa in cactusinhabitat.org

On the basis of our idea of species classification we consequently treated the infraspecific taxa: a) Lowering to synonyms, when the taxon does not present the distinctive characters to be described as species. b) Raising to the rank of species, when the taxon does present these characters. In most cases, the taxa are given back the category that had already been assigned by a previous author. Also in this case, the deleted infraspecific taxa were included among the synonyms.

Taxa treated as synonyms in cactusinhabitat.org compared to NCL

List of taxa (specific and intraspecific) treated as synonyms (10), on the species number we've investigated up to now (151 recognized), detracted to the last total proposed for the family by the ICSG; consisting of 1816 taxa between species and heterotypic subspecies (Hunt *et al.* 2006, text: 5), included the NCL addenda, corrigenda and miscellaneous comments published in the last three numbers of *Cactaceae Systematics Initiatives* (Hunt 2007, 22: 11-18; 2008, 23: 4-29; 2008, 24: 5-40).

Cereus lamprospermus ssp. *colosseus* = *Cereus stenogosus**
Cereus hildmannianus ssp. *uruguayanus* = *Cereus hildmannianus*
Cipocereus minensis ssp. *leiocarpus* = *Pilosocereus minensis*
Cipocereus pleurocarpus = *Pilosocereus minensis*
Copiapoa cinerea ssp. *haseltoniana* = *Copiapoa cinerea*
Copiapoa krainziana = *Copiapoa cinerea*
Discocactus pseudoinsignis = *Discocactus placentiformis*
Parodia ottonis ssp. *horstii* = *Parodia ottonis*
Parodia scopa ssp. *marchesii* = *Parodia scopa*
Uebelmannia pectinifera ssp. *flavispina* = *Uebelmannia pectinifera*

* see Taylor (2007, 22: 10)

03. Comments on species

Discocactus insignis Pfeiffer, *Discocactus pseudoinsignis* N. P. Taylor & Zappi or more simply *Discocactus placentiformis* (Lehmann) K. Schumann. Who lives in Grão Mogol?

Karl Schumann presented *Echinocactus placentiformis* K. Schumann in *Flora Brasiliensis* (1890, 4 (2): 246-247) and he considered *Discocactus insignis* Pfeiffer as a synonym of this. In the original Lehmann's description of *Cactus placentiformis* Lehmann (1826), and in the first Pfeiffer's publication of *D. insignis* (1837, 5: 241) clear indications of its location were not provided. In his monographic work on *Discocactus* Pfeiffer, A. Buining (1980, 71; 89) believes that Schumann stumbled upon an error in considering the two to be conspecific, and he has no doubt that the plants he found at the foot of the mountains near Grão Mogol between 1972 and 1974 correspond to Pfeiffer's *Discocactus*; since this plant is so visible on the sides of the road leading to the town, it could well have been already discovered in 1837. Summarizing their position on the subject (Taylor 1981, 43: 40, Taylor & Zappi 1991, 9: 86), in *Cacti of Eastern Brazil* (2004, 449-450) Taylor & Zappi argue that Buining wrongly identified the plants found with *D. insignis* Pfeiffer, and that whilst the latter is correctly regarded as a synonym of *Discocactus placentiformis* (Lehmann) K. Schumann, the first is rather another taxon namely *Discocactus pseudoinsignis* N. P. Taylor & Zappi, which they have already published in *Bradleya* instead of *D. insignis* sensu Buining, now synonym. This is because in his description Pfeiffer speaks of a plant with 10 ribs, while *D. pseudoinsignis* has usually 12-13, and also the illustration of the type subsequently published by Pfeiffer (1839, 19 (1): pl. 15) shows dark pink bract-scales of the floral tube and outer perianth segments, which is characteristic of some forms of *D. placentiformis*, while *D. pseudoinsignis* have pale brownish-olivegreen outer segments. It is noteworthy that the same illustration (taken for granted before the 1837 publication) is indicated by the authors as lectotype of *D. insignis* Pfeiffer among the synonyms of *D. placentiformis*. We would have some doubt that individuals with 10 ribs could not exist among the populations of *Discocactus* currently living within the P. E.

de Grão Mogol, and especially that the plant illustrated by Pfeiffer (with at least 12 ribs) could not be considered a possible sample of those who live in Grão Mogol. Moreover, the colors shown by Buining for outer perianth segments of its *D. insignis* (see below), clearly belong to Pfeiffer‘s illustration. However what interests us has nothing to do with the choice between *D. insignis* Pfeiffer or *D. pseudoinsignis* Taylor & Zappi, because it is our opinion that they are synonyms of *D. placentiformis*, since, in nature, they do not show any significant difference, and that Schumann’s publication of 1890 was already correct. Both, Buining (1980, 89) and Taylor & Zappi (2004, 449-450), speaking of *D. insignis* or *D. pseudoinsignis*, cannot help but notice how this is similar and included in the habitat of the variable *D. placentiformis*; therefore, they must specify the differences between them, which, however, can all be denied by the observation in habitat and the literature. Indeed, at the end of his description of *D. insignis* Buining generically says that the differences with *D. placentiformis* relate to body and flower of the plant, where the mayor difference is the size of the seed; while Taylor & Zappi say that *D. pseudoinsignis* differs from the other taxon by the ribs without tubercles (usually 12-13 ribs), the color of the flowerbuds and of the outer segments of the perianth, the apex of the fruit and finally the size of the seed.

Let us see how the features of the *Discocactus* of Grão Mogol are really distinct from those of other populations of D. placentiformis. The photographic material relating to *D. insignis* / *D. pseudoinsignis* (http://www.cactusinhabitat.org/index.php?p=specie&id=134, photos 32-47) comes from the P. E. de Grão Mogol.

Ribs

There is no evidence that the ribs of *D. insignis* / *D. pseudoinsignis* cannot be tuberculated. Several mature plants, and not only the oldest, as already noted by Buining (1980, 82), carry well-marked tubercles (http://www.cactusinhabitat.org/index.php?p=specie&id=134, photos 36, 45-46). The almost straight and regular ribs, reported by Taylor & Zappi (2004, 449), are rather found in individuals of small and medium-small size, while medium and large plants usually have large, rounded, sometimes wavy ribs (http://www.cactusinhabitat.org/index.php?p=specie&id=134, photos 33, 36). About the fact that *D. insignis* / *D. pseudoinsignis* has steadily 12-13 ribs (Taylor & Zappi 2004, 449-450), we would say that on average it has 12 to 15 (http://www.cactusinhabitat.org/index.php?p=specie&id=134, see photos). Furthermore, the picture that illustrates *D. pseudoinsignis* in *Cacti of Eastern Brazil* (p. 416, pl. 73.1) shows a plant with 15 ribs; the same picture shows the taxon in *The New Cactus Lexicon* (Hunt *et al.* 2006, Atlas: 290, 290.2). In any case, 12-13 ribs (or even 12-15) cannot be considered a distinctive feature of *D. insignis* / *D. pseudoinsignis*; in almost all populations of *D. placentiformis* the most mature plants carry that number of ribs (see photos of the others population), with the exception of plants found near Bocaiúva, which have a larger number (http://www.cactusinhabitat.org/index.php?p=specie&id=134).

The color of the flowerbuds and of the outer perianth segments

For Taylor & Zappi (2004, 449-450) the characteristic pale brownish-olivegreen of the flowerbuds and of the outer perianth segments in *D. pseudoinsignis*, is confirmed by Buining for the flowerbuds, while for the outer perianth segments he describes a cream-colored-green outside and white olivegreen inside, sometime with fleshy midvein and brown tip (1980, 85). These data already show a variability of *D. insignis* / *D. pseudoinsignis* and they shall be included in the landscape diversity of each population of *D. placentiformis*, which according to Buining (who still considers them a species), ranges from the light-green flowerbuds and white with light-green midstripe outer perianth segments for *Discocactus pugionacanthus* Buining & Brederoo (1980, 63), to the light-green yellow-green flowerbuds with white outer perianth segments of *Discocactus latispinus* Buining & Brederoo (1980, 98-99); from the clear yellow-white flowerbuds of *Discocactus pulvicapitatus* Buining & Brederoo (1980, 103) to those ranging from light green to brown with the white outer perianth segments of *Discocactus alteolens* Lemaire ex A. Dietrich (1980, 30-31); and to the red-brown to brown-green outer perianth segments of *D. placentiformis* (1980, 75).

The color of the fruit at apex

Taylor & Zappi show white to pink or reddish at apex for *D. placentiformis* (2004, 448) and from yellow-orange to reddish at apex for *D. pseudoinsignis* (2004, 449); according

to Buining it appears to be almost white for *D. placentiformis* (1980, 75) and white to white-pink, with a pale cream part above the wool, for *D. insignis* (1980, 87).
Can such elements differentiate two taxa?

The size of the seed

The element that seems to make the mayor difference between the two taxa, according to Taylor & Zappi (2004, 448-450) and especially according to Buining (1980, 77, 87, 89), ie the size of the seed, is synthesized as follows by the authors (measurements length to width): Taylor & Zappi 1.5 to 1.9 x 1.4 to 2.0 mm for *D. placentiformis* vs. 1.0 to 1.4 x 1.0 mm for *D. pseudoinsignis*; Buining 1.9 to 2.0 x 1.7 to 1.8 mm for *D. placentiformis* vs. 1.0 to 1.4 x 1.0 mm for *D. insignis*. This difference also loses importance when we consider that one of the taxa previously recognized by Buining as a species and now treated as synonym of *D. placentiformis* ie *D. alteolens* (Taylor & Zappi 2004, 447; Hunt *et al.* 2006, text: 75), is shown by Buining (1980: 33) to have almost the same size of *D. insignis* / *D. pseudoinsignis*, ie 1.2 to 1.3 x 1.0 to 1.1 mm.

Considering the aforesaid, based on the evidence that stands out from the photographic material and on the fact that even geographically *D. insignis* / *D. pseudoinsignis* enjoys its own autonomy compared to the territorially dominant *D. placentiformis*, our opinion is that *D. insignis* / *D. pseudoinsignis* is included in the previous, and it represents only a population among the many that make up species, not distinguishable as a whole other form.

Parodia claviceps (F. Ritter) F. H. Brandt and *Parodia schumanniana* (K. Schumann) F. H. Brandt: new results about the distribution of the two taxa

The distribution known for *Parodia claviceps* (F. Ritter) F. H. Brandt is located in Brazil (Hunt 1999a, 252), and more specifically in Brazil, Rio Grande do Sul (Anderson 2001, 552). While for *Parodia schumanniana* (K. Schumann) F. H. Brandt is Argentina

(Misiones), Brazil (Rio Grande do Sul) and Paraguay (Hunt *et al.* 2006. text: 223), or Paraguay and Northeast Argentina (Anderson 2001, 552). The surveys we conducted in Brazil (Rio Grande do Sul), in Paraguay (Paraguari) and in Argentina (Misiones), showed that the populations usually attributed to *P. schumanniana*, living in northeast Argentina in the P. P. Teyú Cuaré (Kiesling 1995, 67: 22), are indeed to be identified by morphological characteristics and habitat (see comparative scheme), with *P. claviceps*, here in his most Northwest area, about 250 km as the crow flies from his westernmost detection in the Rio Grande do Sul state (Brazil) in the municipality of Jaguari. It is conceivable, as already suggested by Larocca (1998, 64), that in the Serra do Pirapó and in the valleys of the rivers Ijuí and Icamaquã, which lie between the two sites mentioned above, additional populations of *P. claviceps*, that have not yet been identified, migh be uncovered. It is instead our opinion that *P. schumanniana* is an endemic taxon of Paraguay, differentiated from the plants of Teyú Cuaré. We emphasize that *P. schumanniana* has probably never crossed the great natural barrier formed by the Rio Paraná, and that if this species shows some affinity, it is with *Parodia nigrispina* (K. Schumann) F. H. Brandt, the other endemic *Parodia* of Paraguay. Finally, according with Hofacker (2000, 10: 12), there are no populations of *P. schumanniana* in Brazil.

Revisioned ISO codes

	Hunt (1999a)	**Anderson** (2001)	**cactusinhabitat** (2010)
Parodia claviceps	BR	BR	**AR, BR**

	Hunt *et al.* (2006)	**Anderson** (2001)	**cactusinhabitat** (2010)
Parodia schumanniana	AR, BR. PY	AR, PY	**PY**

Comparative scheme

	Parodia claviceps	***Parodia schumanniana***
habit	simple or clustering	usually simple
steam	globose to clavate < 70 x 25 cm (h x ∅)	globose then cylindric < 180 x 30 cm (h x ∅)
ribs	23 - 38	21 - 48
areoles	> 3-4 mm < 3-4 mm on oldest plants	7-15 mm apart
spines	awl like, curved, wavy or twisted central: 0 - 3 (- 5), < 30 mm radial: 0 - 6 (- 8)	slender, acicular, straight or slightly curved central: 0 - 1, < 10 - 30 mm radial: 5 - 7, the lowest < 65 mm
pericarpel and floral tube	c. 32 mm	c. 20 - 25 mm
habitat	basaltic rock walls of Serra Geral, gradient close to 90°, on the Jacuí and Jaguarí rivers (Rio Grande do Sul, BR); rocky slopes nearly vertical on the Paraná river, in the P. P. Teyú Cuaré (Misiones, AR)	hills with granitic rock outcrops or sandstone reliefs, respectively in the Paraguarí and Guairá Dpts. (PY). Far from rivers.

Parodia mueller-melchersii (Backeberg) N. P. Taylor and its transitional forms

We found our first specimens of *Parodia mueller-melchersii* (Backeberg) N. P. Taylor in November 2006, doing research at the northern area of Lunarejo Valley, near Tranqueras in the Department of Rivera (Uruguay), on Mario Padern’s property. At the time we were not sure of the accuracy of the attribution, as some of the small group of plants observed showed morphological characteristics rather distant from the original description by Backeberg (1936, 254, 415), a description that was basically incorporated, with minor modifications, by Anderson (2001, 547-548) and by Hunt *et al.* (2006, text: 221), as well as being distant from the photos used to illustrate the taxon in the literature (Hunt *et al.* 2006, Atlas: 312, pl. 312.3, 312.4). The characteristics of the Tranqueras specimens (http://www.cactusinhabitat.org/index.php?p=specie&id=97 photos 2-4) that differ the most from the description of *P. mueller-melchersii* are a very elongated body, instead of the almost spherical body that is reported, and almost completely dark red central awl spine, instead of pale yellow with red brown base and dark spots. The same particularities draw the plants closer to the descriptions of some taxa later considered conspecific of *P. mueller-melchersii* (Hunt *et al.* 2006, text: 310), ie *Notocactus veenianus* Van Vliet (1974, 53 (9): 171-173) and *Notocactus winkleri* Van Vliet (1975, 54 (7): 136-139); both with elongated bodies, respectively 20 and 24 cm, apex covered with dark red spines, and both found in the Department of Taquarembó Uruguay. Our doubt was whether the two taxa in question could not benefit from some form of autonomy to *P. mueller-melchersii* because of the diversity noticed; and as a result of the survey in the Department of Taquarembó, near the same named town, in the area between Valle Edén and Tambores, we found the answers we were looking for. In November 2008, looking at different populations of *P. mueller-melchersii* we found that the taxon, in its closest form to the one presented by the literature, is morphologically very similar, almost not distinguished, to some forms of *Parodia mammulosa* (Lamaire) N. P. Taylor with which may live in sympatry, differing from the latter by a greater number of ribs (21-24 vs. 13-21), not flattened central spines and thinner radial spines. However, these elements cannot be always considered as distinguishing between the two. On the other hand, in some populations the plants result to be quite variable, as much as they were taken for “new” taxa, as in the cases of the “discoveries” by Van Vliet. We therefore agree that *N. veenianus* and *N. winkleri* are just synonyms of *P. mueller-melchersii*, as forms of transitions or of different growth of the same taxon; however we believe that if this is true, the next descriptions submitted need to be more elastic and above all that the pictures need to document this variety. So, if *P. mueller-melchersii* can reach 20 cm or more in height (http://www.cactusinhabitat.org/index.

php?p=specie&id=97 photos 2-3, 15-16) and have completely red central spines (http://www.cactusinhabitat.org/index.php?p=specie&id=97 photos 2-4, 24-25), or both the two characteristics (http://www.cactusinhabitat.org/index.php?p=specie&id=97 photos 2-3), although not consistent with, nor so close to, Backeberg's description it must be taken into account. It speaks of a 8 cm high plant, with 6 cm diameter and with a light yellow central spine and dark extremities.

The populations of *Parodia scopa* (Sprengel) N. P. Taylor living in the Quebradas of Treinta y Tres Department, Uruguay. Only a form in the range of the taxon

The distinctive characteristics of the populations of *Parodia scopa* (Sprengel) N. P. Taylor living in the Quebradas of Treinta y Tres Department, in Uruguay, known as *Notocactus scopa* var. *marchesi* W. R. Abraham or *Parodia scopa* ssp. *marchesi* (W. R. Abraham) Hofacker, consist of a smaller number of ribs (23-28), always in the range of the species (25-40), and whitish central spines (Hunt *et al.* 2006, text: 223; atlas: 315, pl. 315.1), sometimes yellowish (Gerloff *et al.* 1995: 78), as confirmed by our investigations (http://www.cactusinhabitat.org/index.php?p=specie&id=99 see photo). Even this feature does not appear to be exclusive of populations of Trenta y Tres, since other groups of *P. scopa* living in Rio Grande do Sul (Brazil) are described with white central spines, such as *Notocactus scopa* var. *ramosus* (Osten) Backeberg, (white to dark brown) (Gerloff *et al.* 1995, 79), yellow as *Notocactus scopa* var. *daenikerianus* Krainz (from yellow to honey-colored), or like *Notocactus scopa* var. *glauserianus* Krainz, from orange to brownish yellow (Backeberg 1966 / en. ed. 1977, 348). For these reasons, besides the fact that no other factor distinguishes it from the other populations of *P. scopa*, if not a relative geographical isolation (even included in the territorial area of the species), we consider the *marchesi* form not so defined to assume the rank of species; and we believe that the taxa that have been considered till now at infraspecific level are synonyms of *P. scopa*.

Parodia werdermanniana (Herter) N. P. Taylor: probably the only endemic cactus of Uruguay

Despite the similarity noted by Osten (1941, 5 (1): pl. 37, 38), in our opinion *Parodia werdermanniana* (Herter) N. P. Taylor is distinct from *Parodia scopa* (Sprengel) N. P. Taylor by the smaller body (13 x 10 cm, compared with 5-50 x 6-10 cm), the color of the stem (yellow green vs. dark green) and the most prominent chin like tubercles, not hidden by the radial spines, which are less (about 16, vs. 35-40 or more), more prominent and not so close to the body plant. *P. werdermanniana* seems to be the only endemic cactus of Uruguay.

Parodia ottonis ssp. *horsti* (F. Ritter) Hofacker: a synonym of *Parodia ottonis* (Lehmann) N. P. Taylor

Given the vast distribution area of *Parodia ottonis* (Lehmann) N. P. Taylor, and its extreme variability, we believe that the features (depressed-globose stem, flatter ribs, fewer and shorter spines) which differentiate somehow *Parodia ottonis* ssp. *horstii* (F. Ritter) Hofacker (Hunt *et al.* 2006, text: 222; atlas: 313, tav. 313.3, 313.4) are not relevant. The first taxon includes the second, morphologically and geographically: this is the reason why we consider the ssp. *horstii* as a synonym of *P. ottonis*.

The populations of *Copiapoa cinerea* (Philippi) Britton & Rose of the Quebrada San Ramon. Hybrids or transitional phases leading to the *krainziana* form?

We agree with Graham Charles on the fact that among the *Copiapoa*, *Copiapoa krainziana* F. Ritter, is the most recognizable (Hunt *et al.* 2006, text: 55), and if we had not been in the Quebrada San Ramon, we would also agree that *Copiapoa cinerea* (Philippi) Bitton & Rose, *Copiapoa haseltoniana* Backeberg, and *C. krainziana*, are distinct. Two hypotheses can be made, following what we could observe.

The first is that *C. cinerea* and *C. haseltoniana*, that already interbreed with each other giving rise to hybrids, as already noted by Backeberg (1966 / en. ed. 1977, 107), also interbreed with *C. krainziana* which lives in the highest part of the quebrada, creating a population with the characteristics of the three. The second hypothesis is that *C. cinerea* (including *C. haseltoniana*), through various stages of transition, results at the end in the altitudinal form known as *C. krainziana*; such assumption have already been taken into consideration (Hunt 2002, 13: 14; Hunt *et al.* 2006, text: 55). It is our opinion that both roads lead in the direction of a single species.

Cereus uruguayanus R. Kiesling: a synonym of *Cereus hildmannianus* K. Schumann

We think that the differences between *Cereus hildmannianus* K. Schumann, and *Cereus uruguayanus* R. Kiesling, namely the length of the flower <25 cm for the first and about 15-18 cm for the second (Hunt *et al.* 2006, Text: 40), and the fact that *C. hildmannianus* is almost always without spines (Anderson 2001, 145), are not sufficient to keep the two taxa separate.

Cereus lamprospermus K. Schumann: a mysterious species, probably not distinct from *Cereus stenogonus* K. Schumann

Given that *Cereus lamprospermus* K. Schumann, is known only through the description by Schumann (1899, 166), and the additions made to it by Ritter (1979, 1: 259) which describes with the name *Piptanthocereus lamprospermus* (K. Schumann) F. Ritter, an arboreal form of Paraguay, and whereas *Cereus lamprospermus* ssp. *colosseus* (F. Ritter) P. J. Braun & Esteves, is known only thanks to one single specimen described by Ritter in Mairana (Santa Cruz, Bolivia) as *Piptanthocereus colosseus* F. Ritter (1980, 2: 554), the species *lamprospermus* must have a rather mysterious look. The only connection between the two taxa is given by the aforementioned descriptions by Ritter that we have above, where the author points out a probable or possible relationship.

The problem in identifying the *P. colosseus* described by Ritter as Schumann's

C. lamprospermus is the Schumann's description, that speaks about a plant with more ribs (6-8) and more spines (8-11, of which the longest <4 cm), compared to the specimen of Mairana, with 5-7 ribs and 5-8 spines in the Ritter's description, however the plant in that site shows in almost all branches to have the lowest number of ribs (5) and spines (5), and these spines, except in the few branches below, are much shorter. The plant also closely resembles *Cereus stenogonus* K. Schumann, an arboreal form, that bears a lower number of ribs (4 (-5)) and spines (2-3), of which the upper 2-5 mm and the lower 6-7 mm. This taxon is fairly widespread throughout the Argentinian and Paraguayan Chaco, and found in the neighboring department of Santa Cruz, Bolivia, as its most north-west area, as Taylor (2007, 22: 10) points out completing the distribution of *C. stenogonus* appeared in *The New Cactus Lexicon* (Hunt *et al.* 2006, text: 42). So we agree, when he states that *C. lamprospermus* ssp. *colosseus* is not distinct from *C. stenogonus*.

Pilosocereus minensis (Werdermann) Byles & G. D. Rowley and its forms

As highlighted in the section on taxonomy, based on our field experience, contrary to Taylor (In Hunt & Taylor 1990, 8: 98-99) and Taylor & Zappi (2004, 282-290) and in accordance with Braun (In Hunt & Taylor 1990, 8: 99) and Braun & Estevez (2001, 3: 104-106, 160-162) we consider the genus *Cipocereus* Ritter not distinct from *Pilosocereus* Byles & Rowley, including in the latter also *Cereus crassisepalus* Buining & Brederoo and *Froribunda pusilliflora* F. Ritter, still kept separate by Braun & Estevez (2001, 3: 106). In *Pilosocereus minensis* (Werdermann) Byles & Rowley, two forms are recognizable in addition to the type species. The first known as *Pilosocereus pleurocarpus* (F. Ritter) P. J. Braun or *Cipocereus pleurocarpus* F Ritter, differing in flower color, namely a red-pink pericarpel and base of floral tube, with yellow tube apex and perianth segments, vs. a dark purple-brown pericarpel and tube, with creamy white inner perianth segments of the *P. minensis*, and finally, according to Taylor & Zappi (2008, 24: 9), because of the different pollination syndromes (hummingbirds vs. bats). The second form known as *Cipocereus minensis* ssp. *leiocarpus* N. P. Taylor &

Zappi can be distinguished (Taylor & Zappi 2004, 288) essentially for the smooth and lack of ribs fruit (http://www.cactusinhabitat.org/index.php?p=specie&id=136 photos 20-21) compared to the ribbed fruit of the type species (http://www.cactusinhabitat.org/index.php?p=specie&id=136 photos 4-5). According to our idea, oriented at the wider definition of the concept of species (see Taxonomy), the differences listed above are considered part of a plausible variation among populations of the same species. To distinguish somehow populations that even geographically do not enjoy an autonomy in relation to the type species, the term form seems more appropriate, as well as the assimilation as synonyms of the taxa cited above in *P. minensis*.

Uebelmannia flavispina Buining & Brederoo: a synonym of *Uebelmannia pectinifera* Buining

The decision to consider *Uebelmannia flavispina* Buining & Brederoo as a synonym of *Uebelmannia pectinifera* Buining derives from the observation that the first appears to be only a form with clearer spines compared to the second, and that also territorially *U. flavispina* is included in the extension range of *U. pectinifera*, in the southeast band of the Serra do Espinhaço.

04. Nomenclatural novelties

New combinations in various South American genera

Parodia neobuenekeri (F. Ritter) Anceschi & Magli **comb. et stat. nov. Basionym:** *Notocactus neobuenekeri* F. Ritter, Kakteen in Südamerika 1: 181-182, 314, fig. 126 (1979). **Type:** BR, Rio Grande do Sul, Camaquã, Feb 1965, *Büneker et al.* in *Ritter* 1397. **Synonym:** *Parodia scopa* ssp. *neobuenekeri* (F. Ritter) Hofacker & P. J. Braun, Cactaceae Consensus Initiatives 6: 10 (1998). *Comment*: Distinguished from *Parodia scopa* (Sprengel) N. P. Taylor by its smaller branches and its circumscribed range in Minas de Camaquã, Rio Grande do Sul, BR.

Pilosocereus crassisepalus (Buining & Brederoo) Anceschi & Magli **comb. nov. Basionym:** *Cereus crassisepalus* Buining & Brederoo, Die Kakteen Lfg. 53 (1973). **Type:** BR, Minas Gerais, Diamantina, 500-1000 m, *Horst & Uebelmann* 169 (U). **Synonym:** *Cipocereus crassisepalus* (Buining & Brederoo) Zappi & Taylor, Bradleya 9: 86 (1991). *Comment*: In accordance with Braun & Estevez (2001, 3: 104-106, 160-162) we consider the genus *Cipocereus* Ritter not distinct from *Pilosocereus* Byles & Rowley, including in the latter also *Cereus crassisepalus* Buining & Brederoo and *Floribunda pusilliflora* F. Ritter, still kept separate by Braun & Estevez (2001, 3: 106). Since the two taxa have been attributed to the genus *Cipocereus* by Zappi & Taylor (1991, 9: 86), and that in nature there is no evidence to distinguish *Cipocereus* from *Pilosocereus*, there is no reason why these should not be included in *Pilosocereus*. Moreover, always Taylor & Zappi (1997, 3: 7) publishing *Cipocereus laniflurus* Taylor & Zappi, they distinguish it just from *Cipocereus crassisepalus* Zappi & Taylor. Now, if we consider *C. laniflurus* a *Pilosocereus*, it seems correct to consider *C. crassisepalus* a *Pilosocereus* too.

Uebelmannia horrida (P. J. Braun) Anceschi & Magli **comb. et stat. nov. Basionym:** *Uebelmannia pectinifera* var. *horrida* P. J. Braun, Kakteen und andere Sukkulenten

35: 264-266 (1984). **Type:** BR, Minas Gerais, mpio Bocaiúva, nr Sítio, 1982 *Horst & Uebelmann* 550 (ZSS, holo., K, iso.). **Synonym:** *Uebelmannia pectinifera* ssp. *horrida* (P. J. Braun) P. J. Braun & Estevez, Succulenta NL 74 (3): 135 (1995). *Comment*: Distinguished from *Uebelmannia pectinifera* Buining as species, by its higher stem, longer spines, and for the separated and northernly distribution, in the west side of the Serra do Espinhaço (Serra Mineira).

05. Conservation

On conservation

Do not touch plants

Since the beginning, have clearly known intentions and methods to be used in this research: do not touch the plants in habitat, and do not pick up specimens or parts thereof. Our observations are performed on the plant site, and the only documentation that we collect are photos, notes and sketches. To identify the detection of a species in a particular area of its range, we put a serial number, preceded by our initials: AM.

Causes of extinction

The growing impact of human activities on the environment, be it for the construction of new infrastructures, such as dams and highways, or for the conversion of native land in agricultural or grazing land, is endangering several cactus species. To these causes of extinction, the illegal collection of rare species must be added, that is carried out indiscriminately by, or on behalf of, unscrupulous collectors.

Preservation methods. In situ and ex situ

As Anderson points out (2001, 79), citing P. F. Hunt (1974, 11-12), the methods to preserve plants are basically three: the first is to let them live without interfering in their habitats, the second is the creation of protected areas (parks, reserves, natural monuments, etc.) dedicated to the protection of specific ecosystems. These two methods are the most desirable, and are known as in situ conservation. The third method, known as ex situ conservation, is that of growing plants under threat far from their original places.

In situ conservation

We said that the best way to preserve the plants is obviously to let them live undisturbed in their habitat; and in agreement with Anderson (2001, 79), we think that the education to the respect of the environment is very important. But, we believe that it is equally essential that the same inhabitants (native or not) are aware of the richness of their territory and therefore defend it. The awareness that the plants must remain in their habitat is important, and for study, is not essential to take them away. As we know, often the economic gap does not help, but it is essential that residents learn to be wary of those who, for a little money, ask them help to steal them their own natural wealth. The plants are protected by local law, and taking them away without permission is a crime: we try to communicate this principle whenever we have the opportunity, and we hope to have achieved some small results.

The other method of in situ conservation is the creation of protected areas in the plants original places, and we have some good examples regarding the cacti. In Chile, where, in the Parque Nacional Pan de Azucar (II° Región de Antofagasta e III° Región de Atacama) there are different species, as *Copiapoa cinerascens* (Salm-Dyck) Britton & Rose, *Copiapoa columna-alba* F. Ritter, *Copiapoa grandiflora* F. Ritter, *Copiapoa serpentisulcata* F. Ritter, and *Eulychnia iquiquensis* (K. Schumann) Britton & Rose; or in the Parque Nacional Laguna del Laja (VIII° Región del Bio-Bio) where *Maihuenia poeppingii* (Pfeiffer) K. Schumann lives. In Brazil, in the Minas Gerais state, the Parque Estaudal da Serra Negra protects populations of *Uebelmannia gummifera* (Backeberg & Voll) Buining, and the Parque Estaudal de Grão Mogol offers protection to the rare *Discocactus horstii* Buining & Brederoo, to *Discocactus placentiformis* (Lehmann) K. Schumann, *Micranthocereus violaciflorus* Buining, *Pilosocereus fulvilanatus* Buining & Brederoo, and to other taxa of the family. Still in Brazil, in the state of Paraná, the Parque Estaudal Villa Velha preserves *Parodia carambeiensis* (Buining & Brederoo) Hofacker. In Paraguay the Parque Nacional T.te Agripino Enciso y Medanos del Chaco (Boquerón) hosts populations of *Gymnocalycium euryplerum* F. Ritter, *Gymnocalycium pflanzii* (Vaupel) Werdermann, *Gymnocalycium stenoplerum* F. Ritter, *Quiabentia verticillata* (Vaupel) Borg, *Stetsonia coryne* (Slam-Dyck) Britton & Rose, and others.

Before a visit to a protected area, we recommend everyone to report themselves to the competent authorities, to ask for permission and to check whether being accompanied by rangers is needed. As you can see from the photos of our surveys, when we introduce ourselves we are always greeted with extreme kindness and we always manage to see and photograph plants. For that reason we did not expect to learn that this does not usually happen: on the contrary, the foreign visitors usually prefer not to announce themselves, in order to be more free. And unfortunately, visitors are sometimes caught trying to steal the plants. Although many of these protected areas are extremely large to be managed by the staff, coverage is usually good, and supported by various devices as in the case of Grão Mogol. where in 2009, the Rangers built their new houses close to one of the populations of the most endangered taxon. Another form of protection, that is also mentioned by Anderson (2001, 79-80), is offered by landowners who are aware of the importance of defending the native species on their properties. Also in this case, when we happened to introduce ourselves, we have always received hospitality and help. But we do not agree with Anderson when he says that a problem with landowners can be that they do not distinguish between people who want to steal the plants, and scientists. The important thing, in our opinion, is being able to recognize respectful people, regardless who are scientists or not. In addition, researchers should be the first to give a good example by minimizing the collection of living material in habitats. On this regard, it could be the time to start thinking another method to try and define a species, or if you prefer a lineage, that is different from a type-specimen which is still today a pressed plant on a herbarium sheet.

Ex situ conservation

If the previous forms of conservation are not feasible, the ex situ conservation remains, ie the cultivation of rare or endangered plants in botanic gardens or nurseries. If in the opinion of some scientists, including Hamilton (1994), this method cannot preserve the genetic variability and evolutionary potential of populations, there is no doubt that nurseries, where cacti are reproduced from seeds, are a deterrent to illegal harvesting of plants. Certainly, conservation in botanical gardens or similar places, is better than nothing, but it is not the same thing: ecologically, and therefore physiologically, it is not the same plant anymore. And we would like to emphasize that, for the same reason, also plants stolen from their habitats are not the same plants anymore. However, a plant that is extinct in habitat, is painfully and definitively extinguished.

In Minas de Camaquà (RS, Brazil) in October 2008, an unpleasant and instructive episode happened to us. By chance we met two Europeans, members of a wellknown association of cactus lovers, which were accompanied by a local couple who to support their position as guides were dressed as Rambo, as if cacti lived in dangerous war zones. During a brief conversation, one of the collectors proudly said that the day that some taxa will be extinct in habitat, their preservation is guaranteed by the specimens that he, and those like him, would have preserved in greenhouses. It sounded like he was waiting for that moment... Unfortunately, what is certain is that the cacti collected by these "preservers", are thanks to those people closer to extinction, and the hotel staff confirmed our suspicions.

CITES and IUCN

The Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) born in 1976, is responsible for regulating the trade of rare species among member states. For this purpose, species were divided into three appendices, depending on the degree of risk that international trade would bring. Appendix I, contains those organisms that would be seriously affected by the trade, that is therefore prohibited between member states. In Appendix II, are those organisms which could be endangered by uncontrolled trade; marketing is then allowed between the member countries only if accompanied by a license. Finally, Appendix III, is used by countries that want to control the trade of the organisms that are not included in the first two appendices. Almost all cacti are listed in Appendix II, and only about fifty species in Appendix I. Since 1980 the World Conservation Union-IUCN (International Union for Consevation of Nature and Natural Resources) has established several categories of danger to assign risk assessments to the species. Following further revisions, the Categories and Criteria resulted, made by the IUCN Species Survival Commission, and published in the booklet *IUCN Red List Categories and Criteria: version 3.1* (2001), also available in www.iucnredlist.org. For risk assessments about conservation status of species, we used the IUCN categories and criteria as specified in version 3.1.

06. Provisional updates and comments on the conservation status

Discocactus hartmannii **(K. Schumann) Britton & Rose**

Following somes surveys conducted in October 2008 in Paraguay between Capiibary (Dpt. San Pedro) and Ygatimí / Reserva Natural del Bosque Mbaracayú (Dpt. Canendiyú) through Curuguaty (still Dpt. Canendiyú), we noticed that the campos cerrados / limpios of this area of the country, that represent part of the habitat of *Discocactus hartmannii* (K. Scumann) Britton & Rose (Esser 1982, 46, fig. 25; vegetation map out of the text), are disappearing because of their conversion into agricultural land, a danger that has already been filed by Metzing (1994). The area of the Reserva Natural Bosque Mbaracayú on the border with Brazil, is well protected and also includes some cerrados, but we could not detect the presence of *D. hartmannii*. The only useful survey of the taxon was done in Capiibary, near the homonymous river, in the territory of one estancia which is still not used as agricultural land. The population encountered consists of approximately fifteen pieces arranged on a piece of land of about 200 square meters, among the fields of another property. Although we do not have sufficient data relating to the conservation status of *D. hartmannii* throughout its geographic range, it seems appropriate to point out a possible risky situation that should be investigated with further research. For this reason we suggest an updated assessment of the conservation of the taxon from Least Concern, LC (Hunt *et al.* 2006, Text: 326) to Data Deficient, DD.

Gymnocalycium paraguayense **(K. Schumann) Hosseus**

As a result of the surveys conducted in September 2008 in various locations of Cordillera and Paraguarí Departments in Paraguay, we could observe the rarity of *Gymnocalycium* *paraguayense* (K. Schumann) Hosseus in the areas adjacent to Pireretá; while in other places, in Chololo for example, it has almost completely disappeared because of, based on information received on site, the indiscriminate collection conducted by so-called European "botanists.., who several years ago raided hundreds of plants.

Metzing (1994) has already assigned the category Endangered, EN to *G. paraguayense*, as well as to *Gymnocalycium fleischerianum*, now considered synonym of the first. As explained, we believe it necessary to update the assessment of the conservation status of the taxon from Data Deficient, DD (Hunt *et al.* 2006, text: 329) to Critically Endangered, CR B1ab(ii,iv,v).

Parodia nigrispina (K. Schumann) F. H. Brandt

Following the surveys we conducted between 2007 and 2008 in the area of Tobatí (Paraguay), we point out that *Parodia nigrispina* (K. Schumann) F. H. Brandt, is probably close to extinction in the wild. In the formation of the Cerro Tobatí we identified a handful of specimens (7), all young and small (h <17 cm). Another population (about 20 units), difficult to access, is located a few kilometers as the crow flies from the Cerro Tobatí on a similar sandstone formation. The situation deteriorated, compared to data collected by Metzing (1994), who had already assigned the category Endangered, EN to the state of conservation of the taxon: such deterioration was partly caused by the continuing indiscriminate harvesting by local residents for the creation of handicrafts. We therefore see it correct to update the assessment of the conservation status Vulnerable, VU D2 (Hunt *et al.* 2006, text: 332) to Critically Endangered, CR B1ab(iii,v)+2ab(iii,v);C2a(i).

Parodia Penicillata Fechser & Steeg

Following the surveys conducted in March and April 2007 in Cafayate (Salta, Argentina) in the streams quebradas Chuscha, Colorado and Yacochuya which constitute the habitat of *Parodia penicillata* Fechser & Steeg, we found a dangerous situation due to the decreased distribution area and number of mature individuals, compared with previous surveys, conducted in November 2005. The main reason for the decline is the collection that is made for Christmas holidays, probably due to the colors of the plant that make it suitable as a gift for the occasion. As explained, we should update the assessment of the conservation status of the taxon from Endangered, EN B2ab (iii) (Hunt *et al.* 2006, text: 332) to EN B2ab(ii,v).

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The cactusinhabitat booklet is due to the need for a printed publication to summarize and complete the major contents of the website cactusinhabitat.org, a project that is exclusively devoted to the study of cacti in their habitat. The site, at its first release (october 2010), features over 2000 photos and takes into consideration 40 genera and 151 species (of which 32 of the genus *Parodia*). It results from the research and reflections of the last five years, half of which spent in South America. The observation of the species in habitat led us to the need for a more simple classification...

Giovanna Anceschi & Alberto Magli

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