

## MONVILLEA KROENLEINII, A NEW SPECIES FROM PARAGUAY

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**Summary.** A new species of *Monvillea* (Cactaceae) from Paraguay, *M. kroenleinii* R. Kiesl., is described and illustrated. The identity of *Monvillea phatnosperma* is discussed and its description emended. The taxonomy of the genus is discussed. Two species are transferred to *Monvillea* as *M. albicaulis* (Britt. & Rose) R. Kiesl. and *M. minensis* (Ritter) R. Kiesl.

### Introduction

During October 1987, with Marcel Kroenlein, former Director of the Jardin Exotique of Monaco, we explored for cacti in Paraguay. Two Paraguayan botanical institutions assisted us. On this trip we found a cactus, without flowers, unknown to us but resembling a harrisia. Later, at Asunción, we saw a photo of it taken by Alexander Arzberger; the flower was that of a monvillea. We are describing this plant here as *Monvillea kroenleinii* R. Kiesl.

A second trip to Paraguay during December 1992 resolved some of our doubts concerning this plant. This time the other participants were Dra. Elisa Nicora of the Darwinian Institute and a specialist in grasses; Licenciada Ana B. Pin, biologist from the Inventario Biológico of Paraguay; and, from Holland, Leo van der Hoeven, an enthusiastic collector of cacti.

### The First Excursion

On the first trip we traveled in eastern Paraguay, an area of dense tropical forest. We found many interesting cacti, including the epiphytes *Selenicereus setaceus*, the widely distributed *Epiphyllum phyllanthus* and several *Rhipsalis* species. Terrestrials included *Frailea*, several species of *Opuntia*, *Cereus*, *Gymnocalycium fleischerianum*, *Parodia* (*Notocactus*) *schumanniana* and the very similar *P. nigrispina*.

After a day in Asunción we went northwesterly by the Trans-Chaco Road, paved only to near Filadelfia. After that the roads were of dirt, satisfactory if dry but slippery as wet soap after a rain; at those times traffic was forbidden and also dangerous. Filadelfia is the only city in the Chaco and is surrounded by intensive farming. For this purpose, large areas of vegetation have been cut and burned. In the rest of the Chaco the complete lack of rain for several months each year makes human activities difficult. All that exists are several military posts, nomadic Indians and a few ranches with zebu cattle.

During this trip, as mentioned before, we found an unknown monvillea. While studying the plant and preparing the description, it became apparent to us that this species had perhaps already been included in the original description of *Cereus phatnospermus*. Herbarium collections on this trip were few because of the long, severe dry season, but even those specimens were lost in a botanical institution in Asunción where we had left them to dry, even a magnificent specimen of *Parodia schumanniana* from Acahai. The only specimens brought home were a few living cacti.

### The Second Excursion

With the main intent of clarifying doubts about *Monvillea kroenleinii* and *M. phatnosperma*, I returned to Paraguay in December 1992 with the friends mentioned above, this time taking a circular route. From Asunción we again took the Trans-Chaco Road to about 60 km from the Bolivian border. From there we returned to Pozo Colorado, where we began traveling east. This route traversed a mixed woodland with palms and large flooded areas. It was a paradise for birds. The only cactus we found—though very abundant—was *Selenicereus setaceus*. Near Concepción we found *Gymnocalycium anisitsii* but failed to find a frailea recorded for the region. We continued east to the Amambay area and the city of Pedro J. Caballero on the border with Brazil. Bluish *Pilosocereus paraguayensis* grew there on rocks. Moving south we explored sandy areas with cerrado vegetation, including *Disco-cactus hartmannii*. This part of the trip was an adventure because we lost our way and drove for hours along flooded trails used for hauling timber and for smuggling narcotics. For a long time, surrounded by dense forest, we circled through deep puddles of water.

Again on "tierra firme" we spent a couple of days in southwestern Paraguay, finding several cacti. Only one of them was new to me: *Echinopsis paraguayensis*, which grew far out of reach on an incredible vertical cliff under a waterfall. Under the trees and grasses Ana found a few rotting specimens that had dropped from the cliff. A couple survived, thanks to Omar Ferrari's care.

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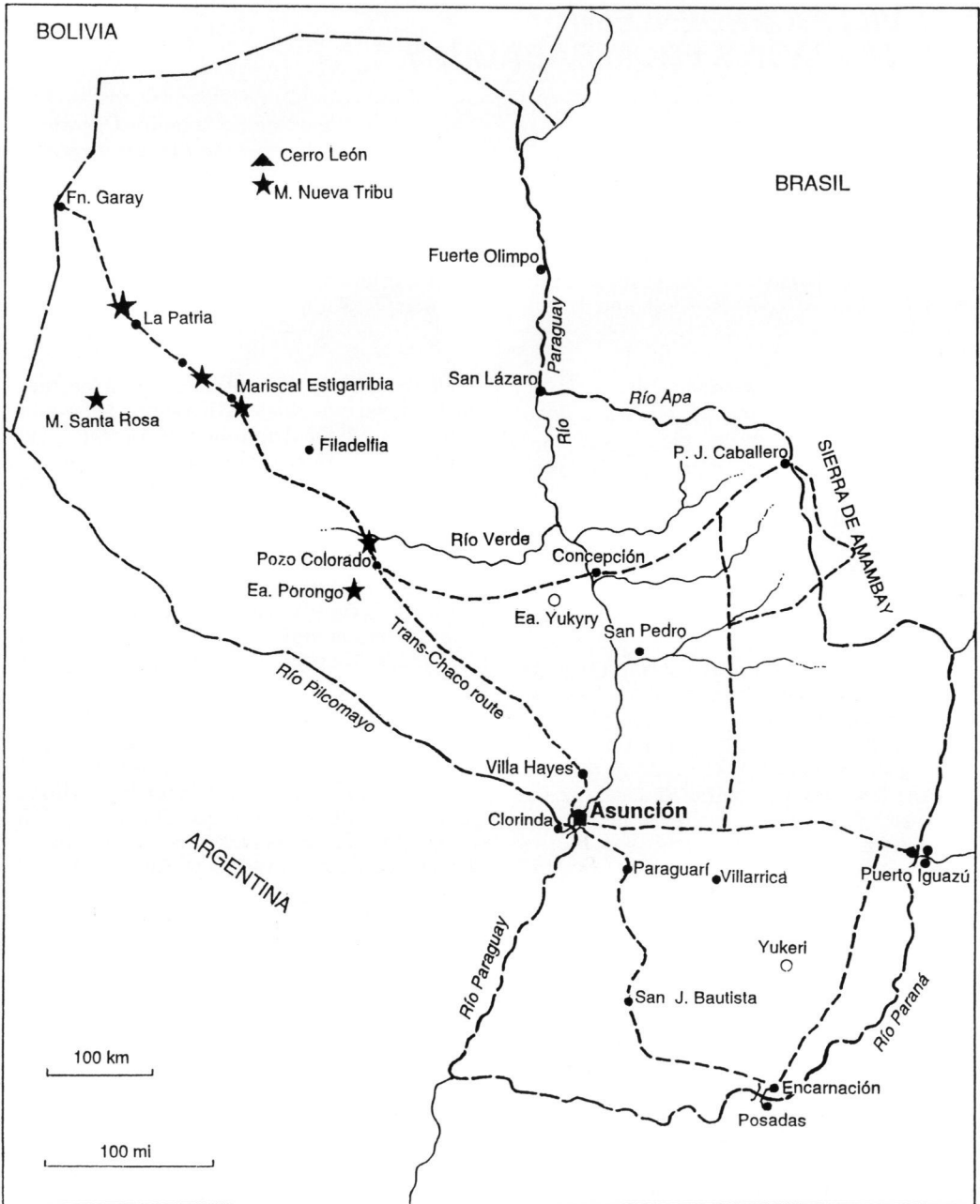


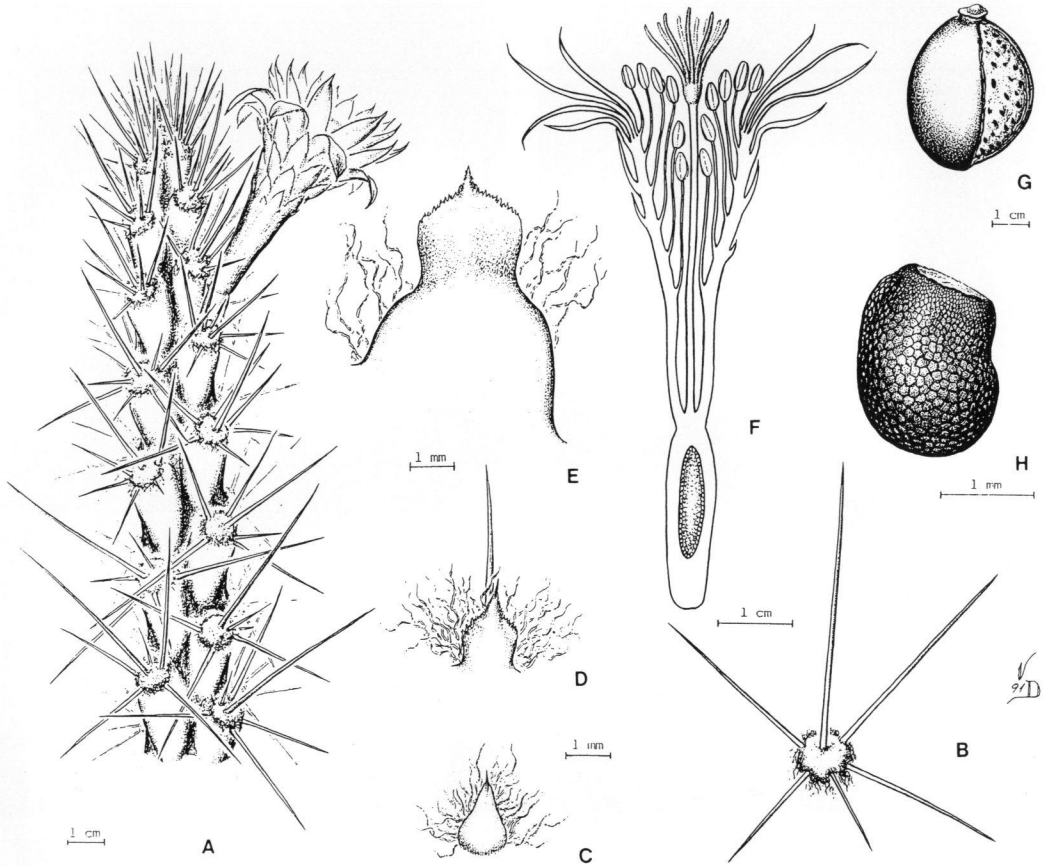
Fig. 1. Map of Paraguay with main towns, roads and localities mentioned in the text.

During this trip we collected hundreds of herbarium specimens of many kinds of plants. Duplicates are in the Paraguayan herbaria of the Facultad de Ciencias Químicas (FCQ) and the Inventario Biológico (PY).

**Antecedents**

Considering that a number of botanists and amateurs have collected cacti in Paraguay during the last century, and considering also that the plant we are calling *Monvillea kroenleinii* is rel-

atively common in some areas, I have been carefully examining many descriptions in *Cereus*, *Monvillea*, *Harrisia*, etc. The closest affinities are two species from Brazil included by Ritter in his genus *Mirabella*. Later my friend Beat Leuenberger drew my attention to the existence at the Berlin-Dahlem herbarium of three jars of specimens labeled as *Cereus phatnospermus*; part of this material is actually *Monvillea kroenleinii*, as will be discussed below. This finding and some similarities in Schumann's description produced



**Fig. 2.** *M. kroenleinii*. **A**, stem with flower. **B**, areole. **C-E**, bracteoles, one with a small spine. **F**, flower-section. **G**, fruit at dehiscence. **H**, seed. (A-F from *Fernandez Casas 4468*; G-H from the plant cultivated at Monaco.) Drawing by Vladimiro Dudas.

some doubts: I strongly suspected that Schumann included two species in his description. For a better knowledge of the new species it was necessary to make new observations in the field and try to rediscover *Cereus phatnospermus*. I was interested in knowing more about natural variation in *M. kroenleinii*, as well as the aspect of the old stems and the form and size of the fruit.

Esser (1982, p. 448, fig. 67) presents an unclear photo that is apparently of *M. kroenleinii*. Moser's book (1985, pp. 36-37) also has photos of it, but Ritter (1979) does not mention the species.

With my doubts resolved, I have decided to publish the new species in honor of its discoverer, Marcel Kroenlein, my good friend and partner on several trips and for many years the charming director of the Jardín Exotique of Monaco, which, under his direction, has grown in size, beauty, scientific value, and number of visitors.

***Monvillea kroenleinii* R. Kiesling, sp. nov.**

Reptans vel ascendens; ramis apice angustato valde tuberculato; costis 4-5, rotundis, sinuatis; areolis in

statu juvenile verticalis, in adulti ramis perpendicularibus, 2.5 cm distantibus; aculeis acicularibus valde pungentibus, radialibus 6-7, centralibus 1. Flore infundibuliformis, albi, externe parce minute squamati. Axillae squamarum cum pilis et aculeis munitae. Bacca ovoidea rubra 37 mm longa, 28 mm diametri.

**Type Collection.** Paraguay, Dept. Presidente Hayes, Río Verde-Pozo Colorado, in sparse spiny forest, *J. Fernandez Casas (4468) & J. Molero, 23-X-1980* ("Cacto 1 m, flor blanca"). Photo 9354, 9355 (G 195521, examined in flower. Original at M, not seen).

Stems 1-2(-4) m long, creeping or ascending, 4(-5)-ribbed; square in cross-section when young, each side 1.7 cm wide, very glaucous; nearly circular in cross-section when mature, 2.5 cm thick, dark green. Areoles ca. 4 mm wide, circular, confluent at the apex, the young ones with their axis nearly parallel to the stem axis, on large podaria, separated 1-2 cm, with long wooly hairs, ca. 0.5 cm long, white, caducous. Spines acicular, very thin and pungent, dark brown with a yellow base; radials five, the inferior one shorter, the others in lateral pairs, ca. 1.5 cm long. Central one, 2-3 cm long, only slightly thicker near base; adult





Fig. 3. *M. kroenleinii* in bud near La Patria, Paraguay. Photo by author.

areoles less hairy, with the axis perpendicular to the stem axis, with three pairs of lateral spines 1.4–2(–2.5) cm long, the inferior one 1 cm long, the central 3.5–6.2 cm long, all gray or grayish.

Flowers funnelform, 9–10 cm long, 6 cm in diam. when open. Pericarpel 2 cm long and 2 cm thick, ovoid, green, with two small triangular bracteoles, these 2 mm long and 1 mm wide, with white axillary hairs 2–4 mm long and sometimes a small thin yellowish spine nearly 5 mm long. Floral tube clearly differentiated from the pericarpel by a narrow zone, conical, ca. 5 cm long and 1–1.5 cm thick, green, with a few (0–3) small bracteoles subtending axillary white hairs 3 mm long. Ovary-chamber subcylindric, 1.3 cm long and 3–4 mm wide, with many ovules. Nectar-chamber subcylindric, ca. 17 mm long and 5 mm wide. Stamens inserted in a spiral in one series above the nectar-chamber in a zone 35 mm long, the lower ones ca. 1.5 mm long, the upper ones 0.7 mm long; anthers 4 mm long and 1 mm thick. Style subcylindric, 4.5 cm long, stigma with 10 subcylindric lobes 11 mm long. Outer tepals 1 cm long, 0.5 cm wide or less, green with a reddish tint, rather fleshy, the margin denticulate. Central tepals to 2 cm long, 0.9 cm wide,



Fig. 4. *M. kroenleinii* flowering at Monaco. Photo: J. M. Solichon.

white, rose-tipped, denticulate, recurving. Inner tepals ca. 1.5 cm long, 0.9 cm wide, entirely white.

Fruits ovoid, nearly 3.7 cm long and 2.8 cm thick, ruby-red, violet-tinged, with a thin wax-cover, dehiscent by a longitudinal furrow. Funicles white. Seeds obliquely truncate, black, 2 mm long, 1.5 mm thick.

Habitat in western Paraguay from near Pozo Colorado to the west, in the dry Chaco. It is abundant in virgin forest, where in some places it literally covers the soil.

**Other Collections Examined.** PARAGUAY. Dept. Boquerón: Mariscal Estigarribia, XI-1982, *A. Arzberger* 78 (one flower in alcohol, SI); Filadelfia, 7-X-1979, *A. Schinini & E. Bordas* 18194 (CORR, SI); Filadelfia, Colonia Fernheim, III-81; *Pastor Arenas* 1847 (“Cacto serpeante en el interior del monte”) (BACP, with fruit and an old flower); Misión Santa Rosa, II-1981; *P. Arenas* 1670, Indian name “la’siyek” (“Cacto serpeante, flores blancas”) (BACP, with flower). Dept. Chaco: Parque Nac. Defensores del Chaco, base of Cerro León, Misión Nueva Tribu, in dense spiny forest, 2-X-1980, 1 m high, flowers white, *J. Fernandez Casas* 4421 (with flower, G 195650; original at M, not seen); between Mariscal Estigarribia and Teniente Ochoa, 10-X-1987, *M.*



*Kroenlein* & *R. Kiesling* s.n., cultivated at the Jardín Exotique (#13373), flowering 30-July-1990, mature fruit 9-Sept-1990 (seeds, SI); from the same collection, cultivated by R. Kiesling. Dept. Nueva Asunción: west of La Patria, 7-XII-92, *E. Nicora* (9761), *R. Kiesling* & *A.B. Pin*, sandy places (SI, with flower and fruit).

On the second trip we observed great numbers of specimens, as well as flowers and (empty) fruits. The adult stems consistently retain the same diameter and shape. The distance between the areoles along each rib is no more than 2.5 cm and the spines remain almost needle-like. These facts eliminate the possibility that the *M. phatnosperma* specimens mentioned below are only mature stems of the same species. Other doubts concerned the fruit: Schumann describes the fruit of *C. phatnospermus* as elliptic, 7 cm long and 2 cm thick, but the fruits appearing in cultivation in Monaco are shortly ovoid and only 3.7 cm long and 2.8 cm thick. Empty fruits in Paraguay agree in measurements with those in Monaco. Thus the size and form of the fruits are also different in both species.

**The Habitat of *M. kroenleinii***

The western Chaco is a very dry area. Rain falls only in summer (December to March) and measures between 400 and 1000 mm a year. With high temperatures the year round, water is quickly evaporated and the remainder filters into the soil. Only one permanent river (the Pilcomayo) crosses the Chaco of western Paraguay but it does not influence the area we visited. Here life depends on small oases which can be dry several months of each year or (for plants and human life) on underground water.

The soils are all sedimentary and are basically of two types, sandy and clay. Most of the Chaco consists of pink clay soils and on them grow trees and shrubs (many of them spiny) that are deciduous in winter. Extending above the trees are large cacti: *Cereus forbesii*, *Stetsonia coryne*, *Pereskopsis (Quiabentia) pflanzii* and *Browningia (Castellanosia) caineana*. Within or near the forest occur *Pereskia sacharosa*, *Cleistocactus baumannii*, *Harrisia pomanensis*, *Monvillea cavendishii* and *M. kroenleinii*. A little rarer are *Monvillea spegazzinii*, *Gymnocalycium pflanzii* and *G. mihanovichii*.

On our first trip, the dry season had been long and severe, the leafless trees appearing to be dead. Herbaceous plants were absent, the ground in the forest being covered by fallen tree leaves. The shriveled cacti began to flower because of their stored-up moisture, but the flowers were smaller than normal. Huge specimens of *Chorisia* were to be seen extending above large shrubs or low trees. An aroid, *Synandropadix vermitoxicum*, displayed its curious inflorescence that emerges from the dried-up soil. The spiny trees are mainly *Acacia*, *Prosopis*, *Capparis* and *Ruprechtia*.



**Fig. 5.** Fruiting plant at Monaco. Photo: J. M. Solichon.

The vegetation on sandy soil consists mainly of grasses (espartillales) or low bushes. Here can be found *Gymnocalycium megatae*, widely distributed in western Chaco but not easy to find and hardly known in cultivation.

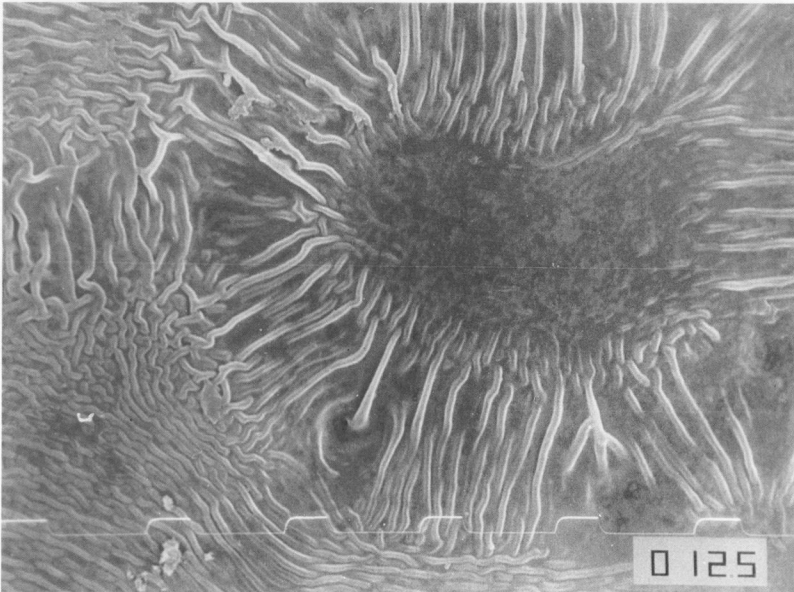
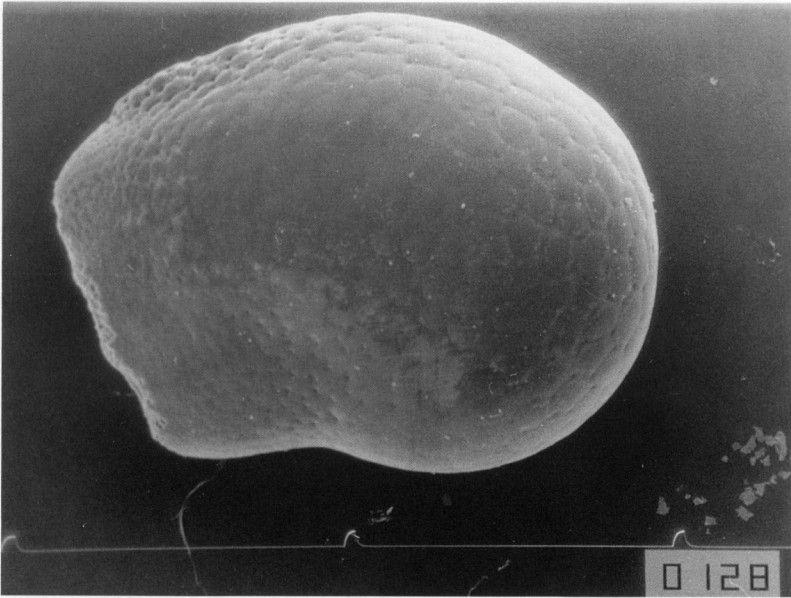
***Monvillea phatnosperma***

*Monvillea phatnosperma* (K. Schum.) Britt. & Rose, The Cactaceae 2:24. 1920.

*Cereus phatnospermus* K. Schum., Monatschr. Kakteenk. 9:186. 1899.

Decumbent, stems 1–2 m long or more, 4–5-ribbed, green. Apex obtuse, hemispherical, not tuberculate. Ribs rounded, obtuse, well-defined even near the stem-apex. Areoles large, almost 0.8 cm wide, hemispherical, with short hairs, separated 3–4 cm. Spines straight (also curving, according to Schumann), strongly subulate, brown; radials five or six, unequal, 0.5–2.5 cm long; central 1, 2.5–3 cm long.

Flowers 12 cm long, pericarpel narrow, cylindrical, to 3 cm long and 8–9 mm thick, bracteole 1, subtending hairs; floral tube with a few bracteoles near base. Outer tepals semicircular, mucronate, to linear-lanceolate and acute, narrowly dentate. Inner tepals lanceolate, acuminate, white. Stamens shorter than the inner tepals. Style hardly longer than the tepals, with many subulate lobes. Fruit juicy, ellipsoid, without bracteoles, 7 cm long, 2–3 cm thick, the apex acute. Seeds



Figs. 6, 7. Seed-testa of Monaco plant. SEM photo taken at the La Plata Museum, Argentina.

1.5 mm long, obovoid, slightly compressed, shiny, black, acute, slightly keeled.

Paraguay: Dept. Presidente Hayes; known from only two localities, Porongo and Yuquerí (Yu-kyry on the Instituto Geografico Militar map).

**Specimens Examined.** Holotype: Paraguay: Porongo, *Anisits* 27 p.p., fl. and fr. 18-Febr-1988. (B, in alcohol, photo). This is the only specimen mentioned by Schumann in 1899 and 1903. The jar is labeled "Cereus 77b"; "Kat. No. 5401"; "A 50" and "214".

The type specimen is in a jar at the Berlin-

Dahlem herbarium; there are three stems, part of another, plus an immature fruit (Fig. 8). The left- and right-hand stems and the small piece underneath have widely separate areoles with strong spines. The stem on the left has a strongly rounded apex. The two central stems have thinner spines, an acute apex, "vertical" young areoles and more approximate adult areoles (compare with the apex on the left). It is clear that the contents of this jar are a mixture, the two central stems (and possibly also the immature fruit) belonging to *M. kroenleinii*.





Fig. 8. Type of *M. phatnosperma* at B. The left- and right-hand stems (Anisits 27) are of this species, while the two smaller stems at upper center are of *M. kroenleinii*.

Certainly this mixture of two species in the type specimen existed before the description was written, for that too is a mixture of different elements. In my opinion, Schumann considered the specimens with strong spines and widely separated areoles to be *C. phatnospermus*. All the specimens designated by Schumann as *C. phatnospermus* correspond to the same species, except part of *Anisits 27*. Apparently Schumann did not have living specimens but only those preserved (and mixed-up) in alcohol by Anisits in Paraguay.

**Other Specimens Examined.** "*C. phatnospermus*, *Anisits 49*" (B, in alcohol). The jar is labeled "*Cereus 77b*"; "Kat. No. 5401"; "A44" and "209".

"*Cereus phatnospermus*. Paraguay: *Anisits s.n.*" (B, in alcohol, see Fig. 9). The jar is labeled "*Cereus 77b*"; "Kat. No. 5401"; "A20" and "183".

It is very possible that these two specimens are part of the type, even though they have a different number. The labels "*Cereus 77b*" and "Kat. No. 5401" are repeated on the three jars.

These last two specimens correspond to the species with subulate spines and do not intergrade with *M. kroenleinii*. Fruits of *Anisits s.n.* are of the size (7 cm long) mentioned by Schumann, but a little thicker. Evidently Schumann used these specimens in writing his description, though he did not mention them.

"Paraguay: Yuqueri, 1885–1895, *E. Hassler 6122603* ("*Cactus erectus 4-angul. 2–3(?)*. Corolla alba sepala viridi. In arenosis prope Yuqueri")." (G, examined). This specimen, identified by Schumann as *C. phatnospermus*, also corresponds to this species. There is a branch, a section of a stem and a couple of flowers.

The original locality of *C. phatnospermus* is Porongo, cited by Schumann (1899, 1903) but not on the jars of preserved specimens. Porongo is a ranch about 30 km southwest of Pozo Colorado in Dept. Presidente Hayes, a little east of the known range of *M. kroenleinii*. We tried to visit this locality on our last trip, but it proved impossible because of heavy rains.

The other locality for *M. phatnosperma* is Yuqueri, mentioned on one herbarium sheet. There is a place with a very similar name (Yukyry) in Dept. Presidente Hayes, south of the Pozo Colorado–Concepción road, and I assume it is the same place. It was also impossible to visit there because of mud. This locality is more to the east—and wetter—than is the distribution area of *M. kroenleinii*. Actually there is another place with the same name in eastern Paraguay (north of Dept. Itapua, Yerbales de Yuqueri), but I think the species does not grow there. Unfortunately, the best season for finding flowers and fruits is the worst one in which to travel.

The stems of *M. phatnosperma* can easily be

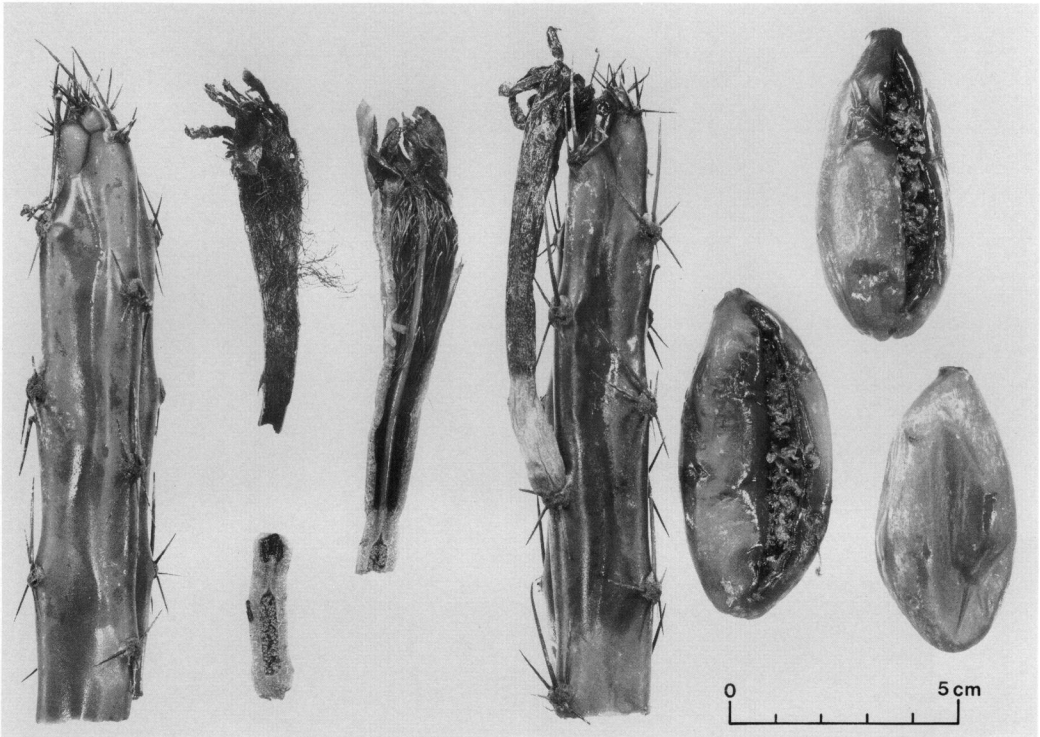


Fig. 9. *M. phatnosperma*, Anisits s.n. Photos courtesy of B. Leuenberger.

confused with those of *Harrisia guelichii* (Speg.) Britt. & Rose. This can cause difficulties in identifying these species in the field in absence of flowers or fruits.

### The Genus *Monvillea*

This genus was created by Britton and Rose (The Cactaceae 2:21, 1920) with *Cereus cavendishii* Monville (Hort. Univ. 1:219, 1840) as type species. The main generic characters are the cylindrical, ribbed stems, which are creeping, ascending or arched (an indication of only slight wood-development), nocturnal flowers with a few receptacular bracteoles with naked to hairy axils, and small, smooth, shiny, almost comma-shaped seeds.

Recently Hunt (1988) expressed doubts about the identity of *Cereus cavendishii*, stating that the name had been missapplied and that the true plant described by Monville was an *Acanthocereus* species. This view has been challenged by Heath (1992), who has thoroughly researched the problem. Heath concluded that the name *C. cavendishii* was correctly applied by Britton and Rose and many others. He definitely solved this problem by designating *Cereus paxtonianus* (undoubtedly a synonym—see Hooker, Bot. Mag. 125, t. 7648, 1899) as the nomenclatural type for

*Cereus cavendishii*. Thus *Monvillea* in the sense of Britton and Rose can be maintained. An additional benefit is the stability of the names in this genus.

In his same work of 1988, Hunt suggested the inclusion of *Monvillea* under *Cereus* subgenus *Ebneria* (Back.) Hunt. In my opinion there are enough differences to keep these genera separate: the columnar habit of *Cereus*, never creeping or arching, implies an important difference in the development of the woody cortex. In *Monvillea* the stems are thinner and with lower ribs than in *Cereus*; the flowers have bracteoles, which are lacking in *Cereus* (or at most vestigial in some species); the seeds resemble those of *Selenicereus*, whereas in *Cereus* they are larger, very rugose, differently shaped, and with a large hilum.

Some years ago Ritter (1979) described a new genus, *Mirabella*, with two Brazilian species. He considered the genus as intermediate between *Acanthocereus* and *Monvillea*, based on the hairs in the bracteole axils. *Acanthocereus* species have flowers and fruits with very developed areoles and are thus, from the evolutionary point of view, far-removed from *Mirabella*. As *Monvillea* also sometimes has small hairs on the receptacle, I consider that *Mirabella* should be synonymous with *Monvillea*. This makes necessary two new combinations:



*Monvillea albicaulis* (Britt. & Rose) R. Kiesl., comb. nov.

*Acanthocereus albicaulis* Britt. & Rose, The Cactaceae 2:125, 1920.

*Mirabella albicaulis* (Britt. & Rose) Ritter, Kakt. Südamerika 1:110, 1979.

*Cereus albicaulis* (Britt. & Rose) Lützelburg, Estud. Bot. Nordeste Brasil 3:111. Inspec. Fed. Obras Sec. Publ. 57.

*Monvillea minensis* (Ritter) R. Kiesl., comb. nov.

*Mirabella minensis* Ritter, Kakt. Südamerika 1:111, 1979.

*Cereus mirabella* (Ritter) N.P. Taylor, Bradleya 9:85, 1991.

**Key to the Paraguayan Species of *Monvillea***

- A. Young stems glaucous. Ribs 4 or 5.
  - B. Young areoles with 3 spines that form a Y, adpressed, more or less subulate, black, shiny. Epidermis glaucous with dark elongated spots. Floral bracteoles naked. . . . . *M. spegazzinii*
  - BB. Young areoles with ca. 5 radiating, very thin, brown spines. Epidermis without spots. Bracteoles subtending hairs and sometimes a small spine. . . . . *M. kroenleinii*
- AA. Stems green. Ribs 4–11.
  - C. Ribs 9–11. Areoles 1 cm apart. . . . . *M. cavendishii*
  - CC. Ribs 4–5. Areoles 3–4 cm apart. . . . . *M. phatnosperma*

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**THE UNIQUENESS OF CACTI**

During the 1920's, '30's, and '40's, John James Thornber (1872–1962) served a long tenure as Professor of Botany at the University of Arizona, Tucson. His interest in cacti started early; his *Native cacti as emergency forage plants*, an Arizona experiment station bulletin, appeared in 1911. Years later, he collaborated with Frances Bonker in writing the popular *The fantastic clan, the cactus family*, published in 1932, and in 1940 he and A. A. Nichol co-authored *The cacti of Arizona* with Lyman Benson. In his article, "Desert Flowers," published in the April 1930 issue of *Ladies' Home Journal*, he expounded on the uniqueness of cacti.

"Cacti are the most unique as well as the most popular group of plants of the day, and the species known to botanists as the Cactaceae are true to type. The name refers to their very characteristic and almost ever-present spiny covering. But so well fixed in the popular mind is the name that many plants of the desert, quite unrelated, are spoken of as 'cacti.' Thus the ocotillo, because of its leafless, spine-clad stems, often 15 feet high, is invariably pointed out as a cactus. To be sure, one of its several names is coachwhip cactus, though the name cannot be accepted as prima facie evidence of its relationship to cacti. Another name is Jacob's staff; however, it is contended that Jacob never would have used the ocotillo for a staff without first having removed the spines.

"Agaves, or century plants, the mescal, or maguey, of the native peoples and Mexicans, also are called cacti, since, except when they blossom, which is but once in their lifetime, they consist of a mass of thick, green spine-tipped leaves. In reality, agaves are members of the amaryllis family [now agave family] and hence are near lilies. They have struggled with nature for an existence, have been baptized with the spirit of the desert, and they, too, have become cactuslike. Christ's crown, or all-thorn, desert buckthorn, graythorn, junco, and other spiny, leafless shrubs are commonly, though incorrectly, referred to as cacti."

Larry W. Mitich