



Fig. 1. Mount Illimani and La Paz, Bolivia. Photo Seymour Linden.

SOME THOUGHTS ON THE SPECIFIC POPULATIONS OF *SULCOREBUTIA* PART I

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It is immaterial at this moment to discuss the question of the generic status of *Sulcorebutia* - except to agree that if a polyphyletic genus is acceptable, *Sulcorebutia* could be conveniently considered to be a section of an enhanced and expanded genus *Rebutia* K. Sch., emended Hunt (Bradleya 5:93-94, 1987). For the time being, however, this acceptance will be held in abeyance.

The gross external morphology for taxonomic purposes differs little between any of the sections of *Rebutia* and *Sulcorebutia*. These differences may seem obvious but their taxonomic significance may be only slight. It is amongst the many described alleged "species" also that morphological differences have been exaggerated, almost to the point of absurdity and triviality.

The type species of *Sulcorebutia* is *Rebutia steinbachii* Werd., occurring around Cochabamba in southern Bolivia. The first plants were collected near Colomi, along the route from Cochabamba to Chapare, by a Herr Steinbach who owned a large Finca or Hacienda near Colomi. Since then (1931), especially in the 1960's, many forms of this plant have been described as new species by Cardenas, Rausch, and others. The status of these "species" is now challenged.

The plants from Colomi were seemingly from a uniform population showing little intrinsic phenotypic variation as the first description suggests; however, within even only a few kilometers the true range of phenotypic variation becomes manifest. The species is in fact extremely variable with

many localized phenotypes capable of maintaining their separate identity, even though only a few kilometers apart. The genetic exchange between these localized forms seems, therefore, to be limited; what the barriers are is not clear and remain conjectural.

The published names of these "species" are:

Sulcorebutia steinbachii (Werd. 1931) Backbg.

S. glomerispina (Card.) Backbg.

S. tuberculato-chryantha (Card.) Don.

S. polymorpha (Card.) Backbg.

S. tiraquensis (Card.) Ritt.

S. lepida Ritt.

S. totoensis (Card.) Ritt.

S. oenantha Rausch

S. pampagrandensis Rausch

S. cochabambina Rausch

S. verticillacantha Ritt.

S. tunariensis (Card.) Buin. & Don.

S. taratensis (Card.) Buin. & Don.

S. mizquensis Rausch

S. kruegeri (Card.) Ritt.

S. hoffmanniana (Backbg.) Backbg.

S. candiae (Card.) Buin. & Don.

S. arenacea (Card.) Ritt.

S. menesesii (Card.) Buin. & Don.

S. muschii Vasq.

S. glomeriseta (Card.) Ritt.

S. krahni Rausch

S. cardenasiana Vasq.

S. langeri Neumann & Falkenburg nom. prov.



Fig. 2. Eddie Aguilar, the author, Myron Kimmach, and Anna Krueger. Photo Seymour Linden.

A number of associated varieties have also been described:

Sulcorebutia steinbachii var. *horrida* Rausch
S. s. var. *gracilior* Backbg.
S. s. var. *rosiflora* Backbg.
S. s. var. *violaciflora* Backbg.
S. s. var. *australis* Rausch
S. tiraquensis var. *electracantha* Backbg.
S. t. var. *longiseta* (Card.) Don.
S. taratensis var. *minima* Rausch
S. menesesii var. *kamiensis* Don.

These really represent only minor population variants. While it is certainly easy to recognize separately each of these species and varieties and maintain their individual identity, it is not necessary nor desirable to consider them as bona fide species or varieties in their own right. They are just phenotypes of a highly polymorphic single species; nevertheless, it is convenient to group them into subpopulations of close phylogeny. These subpopulations are not only morphologically based but also geographically. The separation and isolation of these subpopulations is relatively substantial and the physical barriers clearly defined.

***Sulcorebutia steinbachii*:** Mostly north and east of Cochabamba in the Cordillera de Cochabamba, 3,400-3,900 m (11,200-12,800')



Group 1a: Cochabamba to Chapare, northward and eastward to Tiraque

Sulcorebutia glomerispina
S. tuberculato-chrysantha
S. polymorpha
S. kruegeri
S. hoffmanniana
S. glanduliflora Card. n.n.
S. cochabambina
S. steinbachii & vars. *australis*, *gracilior*, etc.

Group 1b: Province Tiraque to Epizana and eastward to Comarapa, 3,000 m (2,800 m) (9,800' [9,200'])

Sulcorebutia tiraquensis & vars. *longiseta*
spinosior & *aglaia* (*bicolorispina*)
S. lepida
S. krahni

Group 2: Cerro Tunari-south and east of Cochabamba-Izata to Anzaldo, 3,400-3,900 m (11,200-12,800')

Sulcorebutia verticillacantha
S. tunariensis
S. taratensis & var. *minima*
S. mizquensis
S. pojoniensis Rausch n.n.

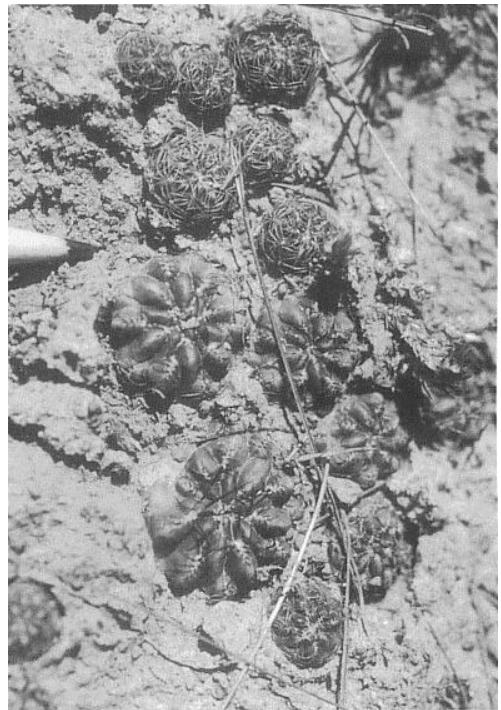


Fig. 4. *Sulcorebutia kruegeri* and *Sulcorebutia tuberculato-chrysantha* near Cochabamba, Bolivia. Photo Seymour Linden.

Fig. 3. *Sulcorebutia steinbachii*, Cochabamba, road to chapare (JD 152).

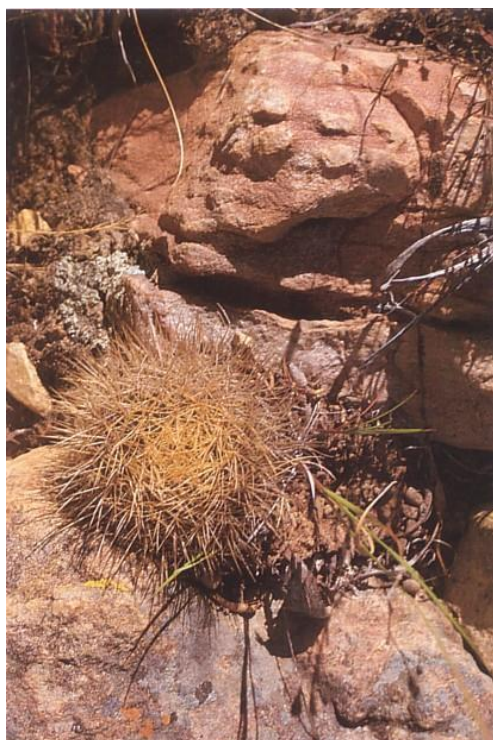


Fig. 5. *Sulcorebutia glomerispina*, Cochabamba, road to Chapare (km 249 / JD 136).

Group 3: West of Cochabamba-Ayopaya, 2,000-2,500 m (6,600-8,200')

Sulcorebutia arenacea

S. candiae

S. menesesii & vars. *kamiensis*

S. muschii

S. glomeriseta

Group 4: Around Totora and southward toward Epizana, 2,600-3,000 m (8,500-9,800')

Sulcorebutia oenantha

S. totorensis

S. pampagrandensis

Group 5: A limited area around Pasopaya and eastwards, 2,000 m (6,600')

Sulcorebutia cardenasiana

S. langeri

Morphological Features

Group 1a

Can grow, especially in cultivation, to relatively large, strongly spined plants - spines long and acicular, up to 50 mm (1.97") in length, from white-yellow, red to black. Flowers not large, rarely more than 35 mm (1.38") long and wide, magenta, red, yellow, or bicolored orange-red in color. Plants often dimorphic - short spined juvenile forms transform at maturity to strongly spined forms. Thus, *S. steinbachii* var. *gracilior* is the juvenile form of *S. tuberculato-chrysantha*. Some of these juvenile forms, however, may persist without transformation to the mature form. High altitude, dry, stony habitats, 3,300-3,900m (10,500-12,800').

Group 1b

Rather more applanate body forms than group 1a but can grow equally large. Spines in two types - strong centrals and weak, bristly radials, long, up to 50 mm (1.97") black, yellow, or bicolored. Flowers similar to 1a magenta, orange-red, red, or, rarely, yellow. Habitat moist, high humus in substrate - often in cracks or on rocks with free moisture flowing between rock surface and soil. Rarely, if ever, dimorphic. Plants usually grow under shrubs, 3,000 m (2,800 m) (9,800' [9,200']).



Fig. 6. *Sulcorebutia tiraquensis*, Monte Puncu, road from Cochabamba to Epizana, a lush, wet hillside (JD 159).



Fig. 7. *Sulcorebutia steinbachii* var. *gracilior*, Cochabamba (JD 141).

Group 2

Small clustering plants with long tap roots, rarely more than 25 mm (1") in diameter each head. Short, pectinate spines up to 6 mm (¼") long, white, yellow, or black, rarely any centrals. Epidermis green or gray-green to very dark. Flowers usually small, less than 30 mm (1.18") wide and long, generally magenta, less frequently bicolored orange-red. Open, stony/rocky slopes, dry habitat, 3,500-3,900 m (11,500-12,800').

Group 3

Moderately sized plants, individuals may reach up to 70 mm across x 50 mm (2.75 x 1.97") high. *S. candiae* is caespitose to a greater extent than either *S. arenacea* or *S. menesesii* but this may be a cultivation effect. The original descriptions or the alleged five "species" of this group suggest strong morphological differences - strongly spined for *S. candiae*, weak, bristly spines for *S. menesesii* and *S. glomeriseta*, and very short pectinate spines for *S. arenacea*. However, much more extensive field collections now suggest that there is a gradual cline between them rather than the sharp differentiation suggested by the original descriptions. *S. glomeriseta* is, however, differentiated from the other members of the group by its quite different seed form. *S. muschii* is very similar to *S. menesesii* in most respects but with fewer spines.

Habitat varies from scree slopes (*arenacea*) to flatter areas or dark humus (*menesesii* and *muschii*) or dry and rocky for *candiae*, 2,000 m (6,600') for *arenacea*, 2,800 m (9,200') for *candiae*. Flower color predominately yellow, rarely orange to red (*menesesii*). Flower size average, 30-35 mm (1.18-1.38") long and wide, *S. glomeriseta* somewhat smaller.

It is difficult to place *S. krahni* and *S. cardenasiana*, also *S. langeri*. Geographically they are all very isolated at the eastern end of the whole distribution of *Sulcorebutia*. Similarly, *S. oenantha* and *S. totorensis*. A swarm of forms exist south of Epizana and around Totorá and eastward. A short spined, green bodied form like *S. steinbachii* also occurs at Epizana which suggests that the genetic influence of the *steinbachii* population extends toward Totorá - certainly it extends farther eastward to Copachuncho where *S. tiraquensis* var. *electracantha* reoccurs (*S. steinbachii* var. *electracantha* - WR 190, FR 374).

The '*tiraquensis*' subpopulation requires a moister climate than the other *steinbachii* populations and this is provided by the overspill of moist air from the Chapare Yungas which occurs eastward from Monte Puncu to Comarapa (Sibiria). (Yungas: Rain forest areas of the higher reaches of the Bolivian tributaries to the Amazon. They create a fog zone that spills over the divide to affect the climate on parts of the dry zone south of it. Sibiria: A district that is permanently fog bound - dripping wet - muddy, and cold in contrast to the dry areas. A very unpleasant place to travel through.)

S. krahni at Cerro Tukiphalla, a few km west of Comarapa, grows in this moister climate. Morphologically this plant is similar to *S. tiraquensis* var. *bicolorispina* (*aglaia*) but the flowers, yellow in color, are quite small and resemble *Weingartia* rather than *Sulcorebutia*.

Group 5

S. cardenasiana and *S. langeri* are almost certainly relicts but their phylogeny is unclear and they should be considered distinct from *S. steinbachii*. They occur south of the Rio Mizque



Fig. 8. *Sulcorebutia tiraquensis* var. *electracantha*, Monte Puncu (JD 159a).

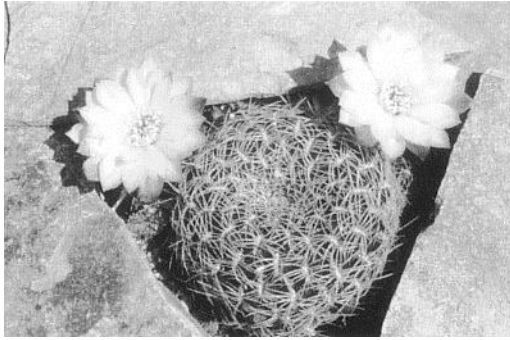


Fig. 9. *Sulcorebutia cardenasiana*, Pasorapa (HS 41).

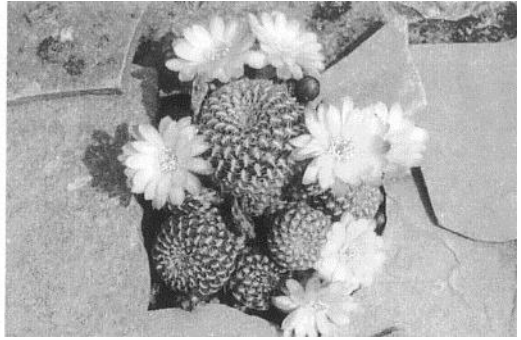


Fig. 10. *Sulcorebutia langeri*, Pampa Grande-Valle Grande (AM Langer).

whereas all the *steinbachii* populations occur on the Cordillera north of the Rio Mizque - the latter would seem to be a convenient geographical line separating the *steinbachii* populations from the other principal *Sulcorebutia* "species." Recent discoveries in the Pasorapa area suggest that *S. cardenasiana* and *S. langeri* may intergrade to form a cline with morphological characters varying only in length of spine - strong, porrect in *cardenasiana* to short pectinate in *S. langeri*.

Both taxa have average sized, yellow flowers. For the moment I will consider these two plants as an isolated subgroup of *S. steinbachii* populations.

Group 4

If one accepts the Rio Mizque as the southern boundary limit for the *steinbachii* populations, then it is reasonable to include *S. oenantha*, *S. pampagrandensis*, and *S. torensis* under *S. steinbachii* but not *S. mentosa*. All three taxa form large, applanate, green bodies with, usually, pale, strong, acicular spines and have larger than average deep maroon to deep red-magenta flowers, or magenta (*pampagrandensis* only). The habitats are open, dry, relatively flat, sandy soils with few rocks, 2,700-2,800m (8,900-9,200') (low for *steinbachii*). *S. pampagrandensis* occurs mainly, on the flat plain at the base of a rocky hillside. A few plants may migrate up the rocky slopes. *S. torensis* occurs from Copachuncho and south toward Lagunillas, some 10 km (6.2 miles) east of Totora. It is important not to confuse *S. torensis* with *S. lepida*. Despite much commentary and discussion concerning their synonymy they are totally separate and distinct plants. Such confusion that exists today is due entirely to a misunderstanding and misidentification of habitat and of plants in cultivation. The true habitat of *S. lepida* is some 50 km (31 miles) east of Copachuncho at 3,000 m (9,800'), growing in moss in contrast to the dry, stony/sandy habitat of *S. torensis*. The flowers of *S. lepida* are invariably smaller and red in color; its spines are softer, yellow or red to black. It is probably best considered as part of the *tiraquensis* subpopulation despite its isolation. The habitat is typically moist, shrubby, and Yungas influenced as for *tiraquensis*.

The differentiation of the taxa of group 1 has yet to be discussed.

(to be continued)



Fig. 11 *Sulcorebutia oenantha* at the type locality : 3 km south of Totora on road from Epizana to Aiquile in very dry, flat, sandy loam (JD 162).



Fig. 12. *Sulcorebutia pampagrandensis*, Hacienda Pampagrande, road from Epizana to Aiquile, in dry, flat, hard sand (JD 163)

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