SOME THOUGHTS ON THE SPECIFIC POPULATIONS OF SULCOREBUTIA
PART 2

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Group 1a

These are relatively strongly spined plants capable of growing into large individual heads or clumps at maturity. There is a strong tendency towards juvenile and mature dimorphism which might confuse one since the juveniles flower as easily as the mature forms. The juveniles are characterized by their short, pectinate spines.

The type *S. steinbachii* achieves its maximum development in the alleged "variety" *horrida* Rausch from Vacas and its immediate area. This form produces large plants with strong, black (rarely red or brown) subulate spines up to 40 mm (19/16 ") long and typical magenta flowers 35 mm (13/8") long and wide.

S. glomerispina also grows into large, well spined plants with spine colors varying from white to black but the radials are much weaker, softer, and bristle-like in contrast to the stiff, strong centrals. Again, the flowers are average in size and magenta colored.

S. tuberculato-chrysantha and its juvenile forms *S. steinbachii var. gracilior*, *rosiflora*, and *violaciflora* differ but little from the type in appearance but the flower color varies from yellow to pale lilac to deep magenta, all of which occur randomly in the same habitat. The juvenile form may persist, especially on the lower, flatter areas of the habitat, transforming to the strongly spined adult form on the rocky summits. The main habitat is the highest point on the Cochabamba to Chapare road at 3,600 m (11,800').

S. polymorpha from Kayrani at 3,400 m (11,200') occurs on a flat, dry, stony area along the banks of the Rio Lopez, just before the moister zone of the *tiraquensis* populations. The plants are typical for *S. steinbachii* – usually dark spines up to 30 mm (13/16") long with yellow or magenta flowers, both colors occurring at random in habitat.

S. cochabambina, an enigmatic species from Rausch, is really a hodgepodge for a rather non-descript population that is quite extensive around Cliza and Arani, north of Mizque and also near Arque. It is very variable in appearance - from short to long spined, epidermis green or bronzed. Spine colors are usually pale rather than black - flowers invariably magenta in color and average in size. The variety *australis* of *S. steinbachii* is, however, larger, more strongly black spined plant from the watershed south of Arani, above Mizque near Yacupartinacu; characterized by red rather than magenta flowers. (Yacupartinacu: A Spanish/Quechua combine to indicate the divide between the waters [Yacu] flowing to the Rio Chapare and those flowing to the Rio Grande. Rio Mizque flows to the Rio Grande also.)

S. kruegeri was described originally from within the city limits of Cochabamba (2,850 m [9.400']). The plant is lost from its original habitat and it now occurs only on a few hills on the outskins - probably soon to be lost to urban development. Again, it is dimorphic with central

Fig. 13. *Sulcorebutia steinbachii* var. *horrida* near Vacas (JD 153).

Fig. 14. *Sulcorebutia polymorpha*, Kayrani (JD 155).

Fig. 15. *Sulcorebutia polymorpha*, Kayrani (RV 316).

spines developing only in old plants. Usually it is found as small, white spined, clumping plants with bright yellow flowers but brown, pectinate spined plants are also known. Other variants include pinkish-green, bicolored spined plants with orange flowers. Cardenas gave us no indication of this variation. Recently, other forms with light red (Donald 132, Kimnach 2720) or magenta flowers (WR 250) have been found. The habitats are typically low, stony, shrubby hills where the plants grow only on the bare, dry summits but not on the slopes. A stronger growing "variety" occurs near Cuchu Punata on the rocky summits
at 3,100 m (10,200'). This is *S. hoffmanniana* which develops strong central spines, yellow to black and paler, weaker radials. The flowers are typically orange-red bicolor but this effect can vary from almost wholly yellow to wholly crimson. There are two other named forms of *S. hoffmanniana* - *S. seinoiana* from above La Villa and *S. vanbaelii* from Tacachi which are only

Fig. 16. Sulcorebutia kruegeri var. “lindenii” n.n. near Cochabamba, Bolivia. Photo Seymour Linden.

Fig. 17. *Sulcorebutia tiraquensis* var. *bicolorispina*, Monte Puncu (JD 157).

phenotypes. The body morphology, spines, and flowers are typically *S. steinbachii* in habit for all these plants. *S. seinoana* also occurs west of Sacaba on the road to Lareto at 3,200-3,400 m (10,500-11,200').
S. tiraquensis, does not occur at the village of Tiraque but farther east toward Monte Puncu where the climate is much moister. The plants from Tiraque itself represent an interesting dwarf form of *S. steinbachii* that deserves description. The plants form clumps of many small heads with white to brown spines, pectinate in juvenile stage and producing strong, short centrals at maturity. The flowers are small and magenta in color. I suspect that these plants might be included under Rausch's S. cochabambina mentioned above; the latter is vaguely defined and needs much more study.

The true *S. tiraquensis* forms grow into large, applanate plants. Cardenas' first description suggests a very strongly black spined plant with large, magenta flowers but the population is much more variable with white, yellow, red, or black spines and magenta or, rarely, yellow flowers. The habitat is very moist and much overgrown with shrubs, ferns, and epiphytes under which the plants hide at around 2,800-3,000 m (9,200'-9,800') – often shrouded in mist from the Yungas a few km to the north. The main route from Cochabamba to Epizana conveniently divides the habitat into two - the moist northern side and a drier, more rocky southern side. On the northern side grow *S. tiraquensis* and the variety *electracantha* which is only a self replicating phenotype with white to yellow spines and orange to red flowers. Both varieties occur at random in the habitat. On the southern side, especially near Epizana, it is somewhat drier where the flat rocks (lajas) split to allow plants to grow in the lateral cracks.

Trichocerei and *Echeverias* grow alongside a distinct variety of *S. tiraquensis* described by Brandt as *Weingartia aglaia* but is normally met in cultivation as *S. tiraquensis var. bicolorispina*. This plant has a much softer, more bristly spination, usually bicolored with dark centrals, black

Fig. 18. *Sulcorebutia kruegeri* var. *kruegeri*, type locality : Cochabamba City (JD 314).

Fig. 21. *Sulcorebutia polymorpha*, Kayrani, on the road from Cochabamba to Epizana (JD 155).

Fig. 19. *Sulcorebutia kruegeri* var. “lindenii” n.n., Cochabamba, road to Chapare, km 243, “type locality” (JD 134).

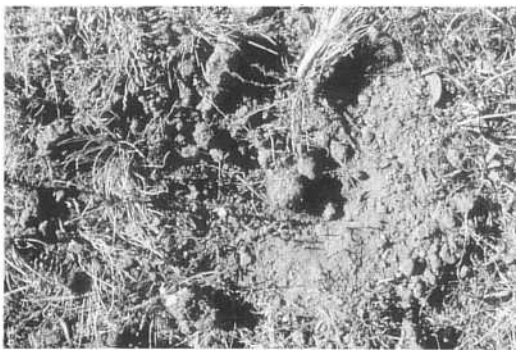

Fig. 22. *Sulcorebutia lepida*, km 170, Epizana-Santa Cruz road, on a mossy, damp, rocky, flat hilltop (JD 304).

Fig. 20. *Sulcorebutia steinbachii* var. *horrida* near Cochabamba. Photo Seymour Linden.

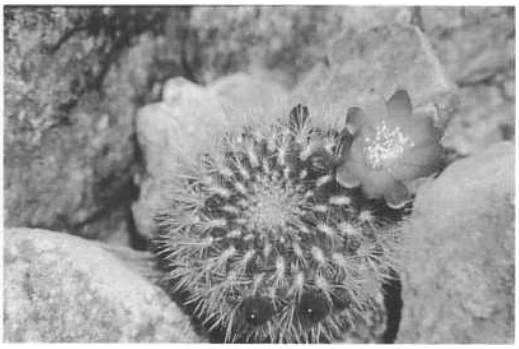

Fig. 23. *Sulcorebutia lepida*, km 170, Epizana-Santa Cruz road (WK 212b).

or reddish, and paler radials, white to yellow. Rarely, wholly white spined plants occur. The flowers are normally magenta but pure orange flowered forms are known. The plants to the east end of the region are more often paler spined and red rather than magenta flowered. There is virtually no barrier, as far as one can tell for genetic exchange between the two populations (northern and southern) yet they maintain their distinct identities. The status of *bicolorispina* is difficult to decide. It is a very distinct phenotype and one is tempted to describe it in the rank of variety.

S. tiraquensis var. longispina occurs only on a very limited habitat, described first from the rocky islet in the Rio Lopez by Lopez Mendoza, from which it seems virtually collected out. It scarcely differs from the type except in its longer, thinner spination and somewhat smaller, light magenta flowers. It possibly grows still on the rocky slopes on the banks surrounding the island which is a bare 500 m long by 100 m wide (1,800 x 330'). A recent expedition in October 1986 reported plants of this variety growing on the hillsides across the Rio Lopez from the small island.

An outlying population of *S. tiraquensis var. electracantha* occurs about 2 km (1¼ miles) west of Copachunchu where it was collected by Rausch (WR 190) and Ritter (FR 374), called by the former as *S. steinbachii* (or *tiraquensis*) *var. spinosior*. The climate, again, in this small zone is moister than at Epizana, or even a few km farther east where, in the drier area, grows *S. totorensis* (see above also for S. *lepida*, another moisture seeking plant).

Also close to Cochabamba city, high up on Cerro Tunari, grows a *steinbachii* form with orange-red flowers – the body and spines are typical of the type species but the flowers are quite distinct, resembling *S. hoffmanniana* in form and color. It has not been described but is in cultivation under the name *S. glanduliflora* (tulip-like) (WK 229). Some collections of this plant have been included as *S. tunariensis* but the latter is a quite separate taxon and a different, if adjacent, habitat. *S. glanduliflora* reported at 3,900 m (12,800') and *S. tunariensis* at 3,600 m (11,800').

Group 1b

Morphologically there is little difference between *S. verticillacantha* (FR 752, FR 752a, and FR 751), *S. tunariensis* (Card.), and *S. taratensis*. All are small clumping plants with strong tap roots, short spines, green to dark green or deep bronzed epidermis, and generally magenta flowers but also bicolored forms of red-orange occur, especially for *S. tunariensis*. However, *S. taratensis* does present some difficulties - the exact habitat is not known except for Cardenas' cryptic sentence "on the way from Tarata to Rio Caine." The only area of sufficient elevation on this route (ca. 3,400 m

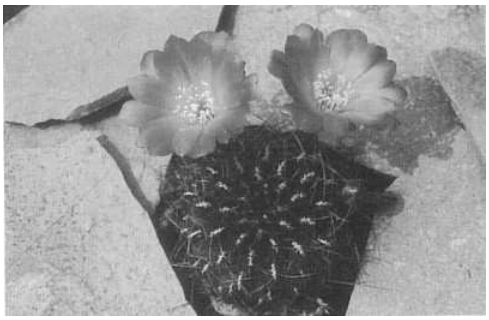

Fig. 24. *Sulcorebutia tunariensis*, Pte. Miquel, Quillacollo (WK 223).

[11,200']) is near Anzaldo where the well known form *S. taratensis* var. minima Rausch is found just to the south at 3,050 m (10,000'). These are clumping, gray-green, short spined plants with strong tap roots and a magenta flower - rarely, larger simple plants occur.

The latter are similar to the Rausch plants *S. mizquensis* and *S. pojoniensis* n.n. which often have white centers to their magenta flowers. Cardenas' *taratensis* corresponding to his photograph and description of the species is little different from Ritter's *S. verticillacantha* but there is an applanate, gray-green, caespitose plant under this name with few, short, white, pectinate spines and a magenta flower in cultivation that is quite different (WK 341). This has not been recollected and only one clone is known. However, Rausch, Donald, and Vasquez, and others have collected plants to the southwest of Tarata on higher ground near Izata at 3,400 m (11,200'); lower than this produced only *Lobivia* species. These plants are *S. verticillacantha*. occurring in both dark green and melanistic forms, flowers again, magenta or crimson.

It is possible that the odd clone represents a single, aberrant form as found near Izata or a form of *S. mizquensis* (Rausch's habitat

Fig. 25 *Sulcorebutia mizquensis*, Tarata to Mizque (WR 194).

for the latter remains a mystery - subsequent visits to the alleged habitat failed to realize any more plants!). Izata is hardly on the route today from Tarata to the Rio Caine by jeep, but the Rio Caine could be reached by descent on the muletrack running south from Izata or from Capinota to the west which is reached at La Viña around 2,000 m (6,600'). (An alternative hypothesis is that this odd Cardenas clone is not the plant described by him but closely related to *S. breviflora* from La Viña which, in the guise of *S. caineana*, does have magenta flowering clones as well as the normal yellow! Krahn found this clone in the Cardenas garden with no other attribute but the name *Rebutia taratensis*.)

S. mizquensis and *S. pojoniensis* are like major forms of *S. taratensis var. minima* - single to multiheaded, gray-green plants with white pectinate spines and larger magenta flowers, often white-centered. Rausch includes part of the *S. pojoniensis* population under his *cochabambina*. *S. mizquensis* needs to be rediscovered but it is clearly part of the *S. verticillacantha/taratensis* subpopulation.

Fig. 26. *Sulcorebutia mentosa* at the type locality : Santa Ana, 3 km south of Aiquile on the road to Mizque, dry rocky slope (JD 171).

The second principal species is *Sulcorebutia mentosa* which occurs south or Rio Mizque and north of Rio Caine. The species itself is found around Aiquile within 3 km (1,9 miles) of the town at 2,250 m (7,400'); thus occurring at much lower altitudes than the *steinbachii* groups. The following described species belong here:

Group 2a
Sulcorebutia mentosa Ritter
S. flavissima Rausch
S. albida (*bruchii* n.n.)
(*Weingartia albissima* Brandt)
S. swobodae Augustin

Group 2b
Sulcorebutia purpurea Donald
S. santiaginiensis Rausch
S. unguispina Rausch
S. jolantana n.n.

Fig. 27. *Sulcorebutia mentosa* var. *swobodae*, 10 km southwest of Aiquile on the road to Mizque, on mossy, moist, rocky flat (JD 280).

Group 2c
Sulcorebutia markusii and *var. longispina* Rausch
S. verticillacantha var. cuprea Rausch

Group 2d
Sulcorebutia torotorensis Cardenas
S. vizcarrae Cardenas
S. viccarrae var. *laui* Don.

Group 2a

The *Sulcorebutia mentosa* populations around Aiquile show two main characters that differentiate them from the *Sulcorebutia steinbachii* populations to the north. The body has generally more ribs, more prominent tubercles, less narrow and more raised areoles, and the flowers longer - 35-40 mm (1.38-1.57") and wider - 35-50 mm (1.38-1.97") or more, generally in pastel shades of magenta to purple-red. The typical spination varies from each subgroup and is not a constant character as in group 2c. It can vary from soft, flexible porrect to strong, stiff or to short pectinate but interlacing. The other subgroups are more homogenous with mostly strong, porrect spination. Spine colors are very variable - some populations show a random mix of colors from straw-yellow or even white, deep yellow, brown, red to black while others may be

Fig. 27. *Sulcorebutia mentosa* var. *swobodae*, a pale form from 10 km southwest of Aiquile (HS 27a).

solely monochromatic. Most variation appears in group 2a. Group 2a is a fascinating, heterogenous mix of diverse forms that all occur within a 15 km (9.3 miles) radius of Aiquile at around 2,200-2,500 m (7,200-8,200'). Mostly, the individual habitats are the summits of dry, rocky slopes facing north and west - but ecotypic variation or adaptation to moister and higher humic soils also is apparent. Under the latter conditions the plants show very soft, bristly spination and a low, very caespitose habit. The flowers, though, show little variation in size and form and differ only in depth and tone or color. White flowers are also quite common amongst the generally magenta flowered populations whereas in the *steinbachii* populations, white flowers are very rare indeed.

S. mentosa, the type, is a dark green caespitose plant, normally with black or dark red-brown spines, occasionally yellow, 10-15 mm (0.39- 0.59") long, centrals stiff, radials less so, occasionally even bristly. Flowers are a pastel magenta in color. Habitat low, rocky slopes, dry.

Fig. 29. *Sulcorebutia mentosa* var. *flavissima*, a white flowered form from Orkho Arbuelo, Aiquile (WR 277).

S. flavissima is a population that occurs a few km northwest of Aiquile, near the Orkho Abuelo, a landmark in the form of a dominating, high, double-peaked hill. The spines are predominately deep yellow, rarely black, and the flowers mostly a bright magenta or, occasionally, wholly white or magenta with a white throat. It is not a good species and should be treated only as a phenotype. The habitat is typical of the species.

S. swobodae occurs in several localities close to Aiquile, none more than 12 km (7½ miles) distant from each other, where the habitat is moister and the soil fairly rich in humus. The plants grow in a mossy terrain usually but also occur higher up the adjacent stony slopes where there is also shrub cover. The *swobodae* populations are characterized by their very soft, bristly domly from wholly white, gray-white, orange, and reddish-brown to black. The plants from the higher slopes often show somewhat stiffer, porrect spines while the spines on the

Fig. 30. *Sulcorebutia mentosa* var. *albida* n. prov., 9 km southwest of Aiquile on the road to Mizque, on dry, shrubby, rocky hilltop (JD 285).

plants in the mossy areas interlace, covering the plant body completely. The flower is identical to *S. flavissima* varying in color from pale rose-pink to deep magenta. The root system of *S. swobodae* is often a thick taproot rather than the shorter ramified roots of the type and *S. flavissima*. Again, *S. swobodae* is best treated at varietal level rather than as a species per se.

S. albida (described by Brandt as *Weingartia albissima*), a predominately white spined form of *S. mentosa*, occurs 10-12 km (6.2-7.5 miles) south and east of Aiquile. The spination varies from adpressed pectinate to solely porrect - becoming more porrect with age and increasing in diameter. Young plants are invariably pectinate spined, while white is the dominant spine color, yellow and brown colors are also found randomly in the populations which are sporadically dispersed over a range of hills - always on the rocky summits under shrub cover. Flower colors are usually pale magenta and a size larger than for the type - fairly long-tubed, up to 40 mm (1.57") in length. Farther east of Aiquile and south from Villa Granado toward Rodeo, the *albida* populations show, even in large, mature plants, only shorter, pectinate spines that do not interlace. Flowers are still as large
but a pale lilac in color, often with a white center (HS 100).

Fig. 31. *Sulcorebutia mentosa* var. *albida* n. prov., 9 km southwest of Aiquile (JD 285).

(to be continued)

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