CPs in Campos Rupestres

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Near the end of the 1991/92 summer vacation, only 2 from around 8 possible trips I'd planned to the interior Brazil had worked out. I decided to stop depending on trips organized by others and go somewhere on my own before I started my second year of Biology at the University of São Paulo. So on February 21, I took a bus and left for the state of Minas Gerais, where I stayed until March 8. The main reason for this trip was to see campo rupestre vegetation, found mainly in the Espinhaco Range in the states of M. Gerais and Bahia(roughly from 1100 to 2100m in altitude), being famous for its incredible diversity of plant species. I'd been hearing about campos rupestres from my botany teachers ever since I'd started university in 1991 and decided I had to visit the 2 most famous campo rupestre areas: the city of Diamantina and the Serra do Cipó (Cipó Range). Campos rupestres consist of low plants growing in harsh conditions in sand mixed with rocky fragments. But this is a generalization, since they're really a reunion of micro-habitats, like a mosaic. These differences are mainly due to soil composition and humidity. The Espinhaco Range is mostly a quartzite formation, but is actually quite a geological mosaic. The soil on these highlands varies from pure sand to bare rock, all draining very fast after rainfalls and soon drying out. But at the same time, water is very abundant, seeping from all sides and forming multitudes of streams.. Thus, not only does the soil change all the time, being more or less rocky or sandy, but it also alternates between wet and dry. It's difficult to define campos rupestres. I wanted to photograph "typical" campo rupestre, but I couldn't make up my mind on what that was!

I took the opportunity that I was in M. Gerais to return to the Caraça Natural Park (3rd time!). I felt it would be a crime to go to M. Gerais and not pass by Caraça! I found out on this trip why I like Caraça so much: contrasts! As I mentioned in my 1st article, Caraça is in a transition zone between coastal rain forests and cerrado (Brazilian savanna). But there's a 3rd kind of vegetation: campo rupestre (which I only heard of for the 1st time after my 2nd trip to Caraça)! I hadn't known that this was what grew on the Caraça Range peaks, where I'd found *D. graminifolia*, *G. violacea*, *U. reniformis*, and others. Adding to these biologic contrasts, are the geographic contrasts. Altitudes vary from around 750 to 2100m. Green valleys are surrounded by tall mountains glistening in the sunlight with water running down the rocky, grey peaks high above, and farther down forming loads of waterfalls Other than being unbelievably cold, the water is a brownish-red, but transparent, color and absolutely clean. Some say this color is due to the high quantities of iron present in the highlands of M. Gerais, but I've also heard that it's due to the extreme acidity of the water, a result of decomposing organic matter. I'm not sure which is true, but I've seen that the waterways of the Venezuelan tepuis also have this strange color. So if anyone knows for sure what makes the water be like this, please tell me.

Luckily, I had excellent weather during my 2 weeks in M. Gerais, with only a few rainy days. A rarity in the summer! In each of the 3 places, I walked from 10 to 25 cm every day! Campos rupestres are great for hikes, due to the rocky landscape, low vegetation, abundance of fresh water, and best of all, CPs grow like weeds!! At the S. Cipó and Diamantina I got tired of having to remove everything from my backpack(camera, CP collecting material, herbarium equipment, etc.) every few steps as I found new CPs! Though CPs are weeds in campos rupestres, they're restricted by factors which I couldn't identify. Each specie grew in a variety of wet habitats, only rarely in specific ones. What perplexed me was that though most were apparently not too picky in regards to habitats, they'd be absent from areas which seemed to be just as good and contained other CPs which, at other sites, grew alongside the absent specie! Very

Figure 1 - Drosera graminifolia photo by Fernando Rivadavia

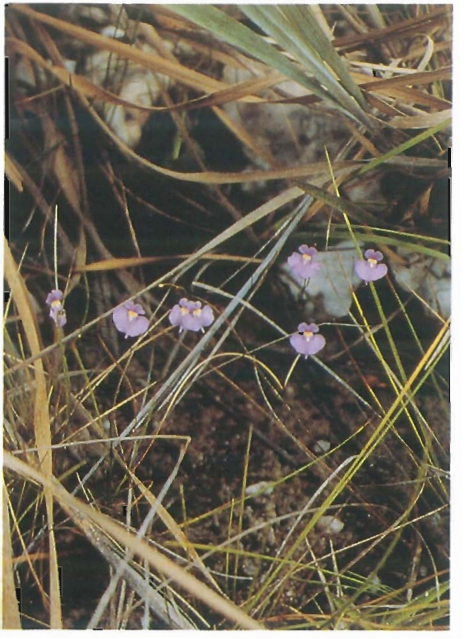

Figure 2 - Utricularia purpureocaerulea photo by Fernando Rivadavia

confusing! At Caraça, campos rupestres occur mostly above 1700m, and this confusion is also observed. In the valley, from 1200m to 1500m, CPs either grow in marshes or in campo rupestre-like habitats next to waterfalls, streams, and on humid, rocky mountainsides. So here is a description of the CPs found on this trip and their habitats (altitudes are approximated):

D. CHRYSOLEPIS - believed to be endemic to the S. Cipó area, until recent collections proved it also grows at various sites in southern Bahia, around 500 km north from the S. Cipó (leaving us with a large gap in its range). Typical plants have stems reaching 4 cm in length, but a stemless form has recently been found at the S Cipó. I expected to see the more common, stemmed form, which is also more spectacular due to its large habit. Strangely enough, I only found stemless plants, growing at 1300-1400m, in very wet, sandy-marshy areas The reddish leaves were up to 14 cm long, 3.5 cm of which were lamina.

D. COMMUNIS - found in all 3 places (Diamantina, S. Cipó! and Caraça) with leaves reaching 2 cm in length, growing preferably in marshes among grasses, between 1200-1450m. *D. communis* flowers all year long and the lilac to light-lilac flowers are borne on delicate scapes up to 25cm tall. Depending on the amount of sunlight, they assume 2 different forms. When not heavily shaded by grasses, the reddish-green leaves are semi-erect and plants are up to 5 cm tall (resembling *D. intermedia*). Under thick grasses, the green leaves are prostrate and the lamina rounder (resembling *D. capillaris*). At Caraça I found marsh which only had white-flowered plants, the 1st I ever saw.

D. GRAMINIFOLIA - I visited my well-known colony at Caraça, on Mt. Carapuca, where they grow at 1750-1850m (not 1900m like I said in my 1st article). I found another colony growing on a neighboring peak at 1850m, also in sandy soil or orange sphagnum. At Caraça they flower from January to March. The hairy, sticky peduncles reach 42 cm in height, opening as many as 6 pink flowers around 1.5 cm across simultaneously on branched scapes. Old plants have stems a few cm long covered with the dead leaves Few plants were found at Diamantina, growing in sandy soil around

1200m, with filiform leaves up to 15cm long (10 cm less than at Caraça). None were flowering but one of these flowered in cultivation in May and later on in August again, the flowers being dark-pink. Flower color may not be constant, but a characteristic which clearly differentiates plants from the 2 locations is that the ones at Caraça are mostly greenish while the ones from Diamantina and other sites in the specie's northern range are more attractive, being reddish. Though the Cipó Range is located between Caraça and Diamantina, *D graminifolia* has never been found there.

D. MONTANA - very common and extremely variable in all 3 places, occurring in various habitats, from 1200 to 1500m Plants reached 4cm in diameter in marshy areas and sometimes only 1 cm in drier areas *D. montana* is a truly polymorphic specie and there's been much discussion regarding the classification of the various forms. I was able to identify 4 varieties: *D. montana var hirtella, var tomentosa , var montana*, and what I believe is a new variety. All of them seem to prefer flowering in the autumn and winter, though they can be found in flower all year long. I found *var montana* flowering at all 3 places. The pink-lilac flowers were around 1 cm across borne on scapes up to 25cm high. The main difference between the various forms is in the peduncles which usually have glandular hairs and/or non-glandular hairs in varying amounts. *var. hirtella's* scapes are covered with long, white hairs. Gland-tipped hairs are found on the top half of *var. tomentosa's* scapes, while normal hairs dominate the lower half (there being a gradual transition). *var. montana* usually only has glandular hairs. The ones I believe to be a new variety have delicate scapes thickly covered with glandular hairs and the seeds are shaped differently from those of other forms. I've observed other differences, but am not sure these are always true. Apparently, *var. hirtella* grows in sunny, boggy habitats, having larger leaves, wider petioles, and being more deeply colored. seems to prefer shadier habitats and is only slightly reddish. *var. montana* grows in a variety of habitats, usually in humid, sandy areas. It's the most widespread and variable of these 4 varieties and still causes much confusion. This 4th variety I've temporarily named *D. montana* var."Dewy scape", due to the appearance of its peduncle. It's been found in the states of Minas Gerais and Parana. The leaves are narrower, the plants smaller, and they prefer sunny, sandy, but not too humid habitats, usually being nicely colored like *var montana*. Though what convinces me that these should be separated from the others are the rounder seeds. I'm trying to hybridize the forms, hoping to get some answers to this wide variation. I think all 4 varieties grew at Diamantina and S. Cipó. At Caraça I've found *var. tomentosa* at 1300m and a larger form of *var. tomentosa* at 1400m. *var. montana* had only been. found between 1250m-1350m, but on this 3rd trip I found thousands thriving at 1750-1850m in a campo rupestre (almost next to *D. graminifolia).*

D. SP"CAMPO RUPESTRE"- gave this temporary name to a specie I discovered growing in campos rupestres at Diamantina and Cipó Range, from 1250-1450m. It 's quite common, often growing alongside *D. montana*. It has flat, orangish rosettes up to 3 cm across, resembling *D. spathulata*. The peduncles are the most distinctive characteristic. First of all, they're totally orangish-red in color and covered with deep-red hairs. Second, they start out growing horizontally for a few centimeters and then grow vertically, up to a total length of around 30 cm. The flowers are pink-lilac like *D. montana* , maybe a bit darker. I believe this is the true *D. hirtella* described by Saint-Hilaire over 150 years ago. The reason why it has caused such confusion among botanists is that it looses important characteristics (like color) after herborization and ends up looking like an intermediate form between *D. montana* and *D .communis*. I'd seen this specie at my university's herbarium and had noticed it was different from both species. It is widespread in Brazil, growing in Minas Gerais, Bahia, and Goiás.

GENLISEA AUREA - I only saw *G. aurea* in the S. Cipó (though it has been collected at Diamantina and Caraça too), forming large rosettes up to 5 cm in diameter, thick with hundreds of strap-shaped, mucilage-covered leaves up to 2 cm long. The glandular scapes on a few plants were up to 30 cm tall bearing large, yellow flowers (though winter is the flowering season). They grew in marshy areas from 1350- 1450m

usually with *D. chrysolepis*, *D. montana var. hirtella*, and *U. nana*.

G. FILIFORMIS as observed at Diamantina and the S. Cipó growing in marshy areas and in sandy soil, from 1200-1450m.. The leaves were up to 2 cm in length while the peduncles reached 11 cm in height, bearing yellow flowers, sometimes slightly pinkish.

G. PYGMAEA - also found in Diamantina plus S. Cipó, growing in sandy soil from 1200-1400m. The leaves were covered with mucilage, like *G. aurea*, and reached 2 cm in length. The glandular-haired scapes reached 12cm in height, bearing yellow flowers.

G. REPENS - found in marshy (mushy) ground in the S. Cipó; at around 1450m with leaves reaching 2.5 cm in length and having scapes up to 8 cm long with yellow flowers. It might've been seen at Diamantina too, but I confused then with *G. filiformis*.

G. VIOLACEA -was quite abundant in Diamantina, S. Cipó, and Caraça (where I discovered new sites). Flowers were up to 1.5 cm and wide, with different color patterns in each of the 3 places, varying from violet or purple to light-lilac, with stronger streaks around a yellow blotch on the lower lip. Leaves reached 1.5 cm in length and peduncles 25cm in height. At Caraça they grew among sphagnum and other mosses, from 1250-1850m (being most common at higher altitudes). At Diamantina, they also grew among mosses, but were most common in sandy soil, from 1200-1400m. At the S. Cipó, I only found them in barely humid sandy soil, from 1400-1450m.

UTRICULARIA AMETHYSTINA - also common in all 3 places, growing in various different habitats from 1200-1400m at Diamantina, 1300-1450m at the S. Cipó, and 1250-1850m at Caraça. The flowers were violet with a yellow-orangish blotch on lower lip at Diamantina. At Caraça and the S. Cipó, they were purplish with some white around a yellow blotch. The flower scapes were up to 18 cm long at Diamantina, 31 cm at the S. Cipó, and 10 cm at Caraça (though in cultivation, the latter has produced scapes over 25cm tall).

U. HISPIDA - found at Diamantina and Caraça, growing among grasses in marshy areas, from 1200-1300m. Peduncles reached 70 cm (Diamantina) and 80 cm (Caraça), bearing light-yellow to dirty-white flowers. The filiform leaves were shorter than the scapes.

U. LACINIATA - the pretty, violet flowers with 1 or 2 orangish-yellow marks on the lower lip (one above the other) are single on top of scapes up to 10 cm tall. They grew around 1400m at the S. Cipó and between 1400-1850m at Caraça, usually in open, sandy soil at campos rupestres. 1 only discovered it was *U. laciniata* when I arrived home in S. Paulo. I'd found similar plants at Diamantina, and thought the plants from all 3 places were U. purpureocaerulea, since they didn't have the lobed lower lip shown for *U. laciniata* in Taylor's monograph (with a few exceptions at Caraça). It turns out that only the ones from Diamantina were *U. purpureocaerulea*, which had entire, and not fimbriate tiny scales on the peduncle base. I saw *U. laciniata* on Mt. Carapuca on my 2nd Caraça trip, but though it was the same as one I'd seen earlier on that trip, which I later discovered was *U. parthenopipes*.

U. NANA - often present in very humid, sandy soil at Diamantina and S. Cipó from 1200-1350m, with single, yellow flowers on pedundles reaching 4cm in height.

U. NEOTTIOIDES - can only be found growing on rocks submerged in cold, acid streams. Found at all 3 places, from 1200-1450m. Peduncles reached 25cm in length and the flowers are cream-colored.

U. NERVOSA -was found in sandy soil and in a marsh at Diamantina at 1200-1250m, with yellow flowers on scapes up to 39 cm tall.

U. PARTHENOPIPES - grows semi-shaded in sandy soil on rocky mountainsides, from 1300-1350m at Caraça. Peduncles reached 7.5 cm in height and held single light-lilac flowers with an orange-yellow spot on the lower lip. This confirms the specie's apparent "jump" from southern Bahia all the way to Caraça, which Taylor was unsure of in his monograph.

U. PRAELONGA - found growing among grasses in marshes from 1200-1350m at Caraças and the S. Cipó. Has bright yellow flowers on scapes up to 82 cm long and

filiform leaves shorter than these.

U PUBESCENS - grows on shaded stream banks in sandy soil, from 1250-1350m at Caraça, sometimes underwater. Distributed along the top half of peduncles up to 15cm in height are violet flowers with 2 yellow marks on the lower lip(one above the other).

U. PURPUREOCAERULEA- grows abundantly around Diamantina mostly in pure sand, at 1200-1400m. Peduncles were up to 12cm in height bearing single, lilac-purple flowers with a yellow spot on lower lip. Hard to believe it's been collected such few times, as Taylor says in his monograph.

U. RENIFORMIS - only found at Caraça, growing best in sphagnum (with *G. violacea* plus *D. graminifolia*) and in decaying organic matter under the semi-shade of bushes at 1800m, where leaves are up to 45 cm tall and lamina reach 10 cm across. The flowers nod at the end of scapes up to 105 cm long and are stunningly beautiful! They may be up to 5 cm tall and wide, varying from light-lilac to violet in color. On the lower lip are 2 verticle yellow stripes, each inside a white stripe, which is sometimes surrounded by a dark violet ring. *U. reniformis* is also found growing on humid rocks receiving spray from waterfalls, in semi-shaded to very shady places from 1250-1800m. In this case, the leaves are practically sessile and only a few centimeters across. I never found plants in this condition flowering.

U. SIMULANS - grew in sandy-muddy soil at Diamantina and S Cipó, from 1200-1300m, with yellow flowers on scapes up to 11 cm tall. The fringed calyx lobes are the outstanding characteristic in this specie.

U. SUBULATA - worst CP weed known, grew anywhere and everywhere at all 3 places with yellow flowers on scapes up to 15cm tall.

U TRICHOPHYLLA - grows in shallow water in marshy areas, around 1200m at Diamantina and 1400m at the S Cipó, with yellow flowers on scapes up to 20 cm tall.

U TRICOLOR - found at Diamantina from 1200-1350m,
most often with sphagnum in sandy soil on stream sides, bearing violet to lilac flowers with an orange-yellow or yellow spot on the lower lip, on top of scapes up to 40 cm long.

At the S. Cipó found at 1300-1450m growing among grasses in very wet, sandy areas or in marshes, with scapes reaching 62 cm in length.

U. TRILOBA - grows in all 3 places at 1150-1450m with scapes up to 25cm tall I'd never noticed it at Caraça due to its extreme similarity with *U. subulata*

U. SP. "PYGMY-AMETHYSTINA" - probably what used to be *U. hirtella* but now considered a synonym of *U. amethystina* by Taylor. Found at all 3 places, growing in sandy-muddy soil from 1200-1450m, but never near *U. amethystina*, from which it is distinctly different the in wild. Its smaller in size, with peduncles up to 17 cm tall but usually shorter. The flowers are tinier, varying from light-lilac to white to light-yellow. Right after I returned from M Gerais in March, I found this specie growing among CPs from the Parque National das Emas and soon realized it was the white-flowered specie I'd found at the Chapada dos Guimarães in 1991.

This trip turned out to be the most fruitful CP-hunt I' ve ever gone on, with 27 species found! It was also the best of all the trips I've made to the interior of Brazil. Since I was alone, I could stop when I wanted to and not worry about others not interested in PCs and wanting to push on, nor did I have to worry about slow people holding me up. To reduce weight during the trip I sent various boxes with CPs through the express mail which is supposed to arrive the following day to a friend in São Paulo and paid quite a lot money for it. Unfortunately, for reasons unknown to me, the plants from Diamantina took 5 days to arrive while the ones from the S. Cipó took 8 days. I hadn't foreseen this and hadn't worried about the plants being excessively wet, thinking that a day in the mail would be no problem. The result that I lost around 30% of the CPs from Diamantina and 60% of the ones from the Serra do Cipó. The *Drosera* came out best, but most of the *Genlisea* croaked. Well disasters like these only help stimulate my desire to return as soon as possible and explore these areas more deeply!!