Wild *Capsicum* in the area of the Amboró National Park in Bolivia

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1. Introduction

<01: Leonardo taking photos of *C.minutiflorum*>

Leonardo and me are both members of the Italian Association "Pepperfriends" which has the aim to deepen and spread the knowledge on *Capsicum*, especially wild species.

<02: Poster presented at Eucarpia 2013>

At Eucarpia in Torino I presented a poster documenting about ten South East Brazilian endemic species, which I have found during four trips.

Now it's up to Bolivia!

<03: Bolivian wild *Capsicum*>

The incipit of our article was "Bolivia is believed to be the source of the genus *Capsicum*".

A recent article claims that this is not true; however, Bolivian *Capsicum* deserves a report, especially the group now named Bolivian clade.

At least nine species of wild *Capsicum* grow in Bolivia:
Capsicum baccatum L. var. *baccatum*
Capsicum caballeroi Nee
Capsicum cardenasii Heiser & Smith
Capsicum ceratocalyx Nee
Capsicum chacoense Hunz.
Capsicum coccineum (Rusby) Hunz.
Capsicum eshbaughii Barboza
Capsicum eximium Hunz.
Capsicum minutiflorum (Rusby) Hunz.

Some possible new species are under investigation, including the enigmatic *Capsicum pubescens*. ssp. *arachnoideum.*

Botanists have done a huge work of collection and documentation; many of these species are preserved in herbaria and described in articles through drawings.

However, few or no live images are available for some species.

Some Bolivian species are grown and well documented by many enthusiasts of *Capsicum* because they are available in seed banks.

<04: *C.eximium*, *C.chacoense, C.cardenasii* and Rocopica>

Some of these, such as *C.eximium* and *C.chacoense,* are documented even in their habitat, but there are no photos taken in the wild for other species such as *C.cardenasii* and Rocopica.

We wished to observe the characteristics of endemic Bolivian species in the wild and produce a better documentation of live plants.

So we planned a trip to Bolivia to explore the area where most of the less known species are concentrated: the Amboró.

2. Material and Methods

<05: Amboró National Park>

The Amboró National Park covers over four thousands square kilometres in the department of Santa Cruz; it's surrounded by an Integrated Management Natural Area.

The Park contains many different habitats, being located at the confluence of several unique floristic regions.

The altitude varies from about two hundreds meters to over three thousands meters in the cloud forest on the southwestern border.

The park is the best place to start the exploration because endemic little known species grow in it.

The trip lasted two weeks, between late November and early December 2015.

To prepare the trip we studied almost all the literature available, including herbarium sheet labels.

We received precious information by professors Michael Nee and Joshua Tewksbury.

<06: Map of our trip on Google Earth>

We planned a path to visit in few days as much as possible of the sites where *Capsicum* species were collected and new promising sites.

The first stop was the Jardin Botanico of Santa Cruz de la Sierra.

Then we moved along the old road to Cochabamba exploring Quebrada Salada at Tarumá, the surroundings of the Rio Piraì at Bermejo, La Yunga and Quebrada Seca at Mairana, the surroundings of El Empalme and the road to Khara Huasi, the high-altitude forest North of Comarapa (entering deeply in the park).

Then we visited Mataral and Vallegrande.

Finally, we explored the area South of Buena Vista along both sides of the Surutú river and the Park around La Chonta.

<07: Checklist>

We prepared a very accurate checklist to record the characteristics of the species.

3. Results

<08: Wild *Capsicum* in the Amboró>

Thanks to a precise planning, the choice of the right time, a well-established experience and a bit of luck, we found almost all of the species growing in the area, often bearing both flowers and ripe and unripe fruits.

We found populations of the following wild species:

C.minutiflorum (Rusby) Hunz.

C.caballeroi Nee

C.eximium Hunz.

C.baccatum L. var. b*accatum*

C.coccineum (Rusby) Hunz.

We also found wild individuals of the cultivated species *C.frutescens*.

We fully described and documented these populations with many detailed photos.

For a complete description, please read our article; in this presentation we focus on the images.

<09: *C.caballeroi*>

<u>*Capsicum caballeroi*</u> (locally known as ají de monte or ulupica de yunga) grows in the “bosque nublado” (cloud forest) at over two thousands meters on South-West Amboró.

We didn’t find it in many of the sites where it was collected in the past; we only found some very old plants and few small plants along the dirt road from El Empalme to Khara Huasi, at about two thousands five hundreds m.

<10: *C.coccineum*>

<u>*Capsicum coccineum*</u> (locally known as ají de monte, aribibi silvestre or tà yejti) grows in the tropical evergreen forest on East Amboró, at 3-4 hundreds meters.

We only found it inside the Park near La Chonta.

<11: *C.minutiflorum*>

<u>*Capsicum minutiflorum*</u> grows in subtropical semi-deciduous forest, at three hundreds to one thousand m, on South-East Amboró, in shady, moist places.

We found some isolated plants in the Jardin Botanico, a small population along the Rio Piraì at Bermejo, other plants in the bends of the Surutú river near El Carmen.

<12: *C.eximium*>

<u>*Capsicum eximium*</u> (locally called ulupica) grows in subtropical deciduous dry forest at about two thousands m on South-West Amboró and Vallegrande.

This species is spread even in South Bolivia and North Argentina.

We found some adult plants bearing flowers and fruits at Comarapa.

At Vallegrande we found many plants flowering, but with few immature fruits, because of rains delay.

<13: *C.baccatum* var *baccatum*>

We found *Capsicum baccatum* var. *baccatum* in many places around the Amboró limits and in the Jardin Botanico of Santa Cruz.

<14: *C.frutescens*>

Capsicum frutescens (locally called aribibi or arivivi) was found along the dirt road to La Chonta.

4. Discussion

The *Capsicum* of Amboró are well differentiated and present many particular characteristics.

Campanulate corolla.

<15: Corolla of *C.caballeroi*>

The most intriguing feature is the campanulate, bright yellow corolla of *C.caballeroi*.

Only few species of *Capsicum* have the corolla campanulate.

The first exception to the stellate corolla was found precisely in Bolivia: *C.cardenasii*.

<16: *Capsicum* with campanulate corolla>

Afterwards, the astonishing campanulate-urceolate corolla, entirely lilac-fuchsia, of *Capsicum friburgense* was found in South-East Brazil.

Pungency.

<17: fruits of *C.caballeroi*, *C.minutiflorum* and *C.eximium*>

The pungency of fruits is unexpectedly high in *C.caballeroi*.

C.minutiflorum heat varies from medium to almost absent. Some populations not pungent are mentioned in literature; however, all the fruits that we tasted were hot.

C.eximium fruits heat is medium.

C.coccineum should be very hot, but we could not taste ripe fruits.

Variability of *C.eximium*.

The variability of morphological traits in *C.eximium* is very interesting.

The pubescence varies from plant to plant.

<18: Corolla variations in *C.eximium*>

In this area most flowers have withish corolla with green spots, but some individuals show some purple shades in corolla and buds.

In other areas *C.eximium* has an entirely purple corolla with greenish spots.

<19: small flower of *C.eximium* with large anthers.

Around Vallegrande some plants had strange flowers with very small corolla and anthers of abnormal size.

Spread of species.

<27: Spread of Bolivian wild *Capsicum*>

The Bolivian wild *Capsicum* appear to be quite rare.

They are spread on a wide area, but always in few individuals or very small populations.

Only *C.eximium* and *C.chacoense* form large populations.

We did not find *Capsicum* in many sites where they were present in the past.

Some areas seem no longer suitable for wild species, because of the increase of agriculture and grazing.

<20: La Yunga>

For example, at La Yunga de Mairana, near the "bosque de helecios gigantes", we found cultivated and fenced fields in sites where *C.caballeroi* and another accession not identified were found.

<21: The Park at Comarapa>

However, these species should not be at risk of extinction because they can rely on a wide, still intact and partially unexplored habitat.

<22: Quebrada seca>

We had no luck in finding *C.eshbaughii* at Quebrada Seca, one of the two original sites where it was collected about thirty years ago.

It was classified as *Capsicum eximium* var *tomentosum* because it differs from *C.eximium* for pubescence and type of trichomes (and calyx with 10 teeth).

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Recently it was described as species apart.

Even other recent expeditions did not find this species.

Further investigations are necessary to verify if it is still in the wild.

<23: Mataral>

The *arachnoideum* was found few times around Mataral, but sites are not documented; we didn't find it.

Locals told us that many plants of *C.eximium* grow in the area, but they were "palo seco" (only stem and branches, no leaves) because of scarce rainfall.

Relationship with cultivated species.

<28: Relationship with cultivated species>

C.caballeroi, *C.minutiflorum* and *C.coccineum* don't appear to be close to any domesticated species.

C.baccatum var *baccatum* should be the wild ancestor of cultivated *C.baccatum*.

C.pubescens ssp. *arachnoideum* could be the wild ancestor of *Capsicum pubescens,* but very few information are available.

<24: Rocopica>

C.eximium and the similar *C.cardenasii* are related to *C.pubescens.*

These species cross easily with each other, generating the interspecific cross known as Rocopica (rocoto plus ulupica); however, there is almost no information on this cross in the wild.

Use by locals.

<25: Fruits at the market>

Bolivian wild species are well known by the locals who use them, know their common names and their features, including flowering and fruiting time.

Locals in Vallegrande, Comarapa and Mataral were able to give us indications on where to find plants and their vegetative stage.

Locals in Buena Vista know yellow-flowered *ulupicas* (probably *C.coccineum*) growing inside the Park.

However, we visited many markets and we did not find fruits of ulupicas for sale; only locotos and aji.

Conclusion.

<26: Amboró National Park>

The exploration and the search for wild species in the Amboró National Park in the past were limited to the peripheral areas of the park; probably more populations and perhaps new species live inside the Park, in areas difficult to reach and unexplored so far.

So, there is still much work to do … and we will try to do a bit of it!