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Tephrocactus verschaffeltii – A surprising addition to the cactus flora of Peru

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Photographs by the author except where stated

Summary: *Tephrocactus verschaffeltii*, until recently better known as *Austrocyliindropuntia verschaffeltii*, has hitherto only been known from Argentina and Bolivia. A single population discovered growing at 3660m in the department of Moquegua, Peru is approximately 400km distant from the next known population in the department of La Paz in Bolivia. This new population confirms *Tephrocactus verschaffeltii* as a member of the Peruvian flora and *Tephrocactus* as a new generic record for Peru.

Zusammenfassung: *Tephrocactus verschaffeltii*, bis vor kurzem besser bekannt als *Austrocyliindropuntia verschaffeltii*, war bisher nur aus Argentinien und Bolivien nachgewiesen. Eine einzige Population wächst auf 3660 m im Departement Moquegua, Peru, ungefähr 400 km von den nächsten bekannten Populationen im Departement La Paz, Bolivien, entfernt. Diese neue Population bestätigt *Tephrocactus verschaffeltii* als Teil der peruanischen Flora, und *Tephrocactus* als neuen Gattungsfund für Peru.

Introduction

Issue number 24 of *Quepo*, the journal of the Peruvian Cactus Society, published in 2010, contained an excellent article by Daniel Montesinos Tubée (Montesinos, 2010) documenting the cacti and succulents found in the remote and little visited province of General Sánchez Cerro in the department of Moquegua, Peru. The province is situated in the north of the department, sandwiched between the departments of Arequipa on the west and Puno on the east. The area is predominately high Andean altiplano but also includes the upper reaches of the Río Tambo (Figure 2), which cuts through the area forming a deep gorge with a sheltered micro-climate at lower altitudes than the surrounding altiplano.

Daniel visited the region between 2005 and 2012 and recorded a flora containing over 500 species (Montesinos, 2011, 2012) including 17 cacti in 8 genera. One photograph in particular published in his *Quepo* paper caught my attention (Fig 1.7 on p.30) which is captioned “*Cumulopuntia* sp.”. The illustration shows an opuntoid with clusters of variable shaped stems, some small and almost spherical, others elongating and finger-like

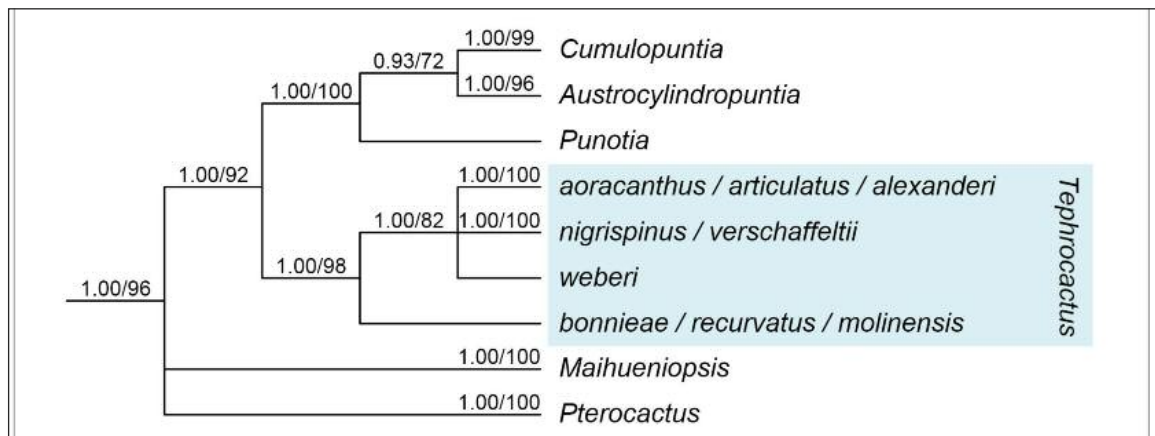


Figure 1. Simplified Bayesian phylogeny of the tribe Tephroacteae showing constituent genera expanded to species level within *Tephrocactus*. Statistical support based on combined sequences of the *trnK/matK* region and *phyC* exon 1 region. Posterior Probabilities (PP) and Maximum Likelihood Bootstrap percentages (BS) are given above branches (PP/BS). Based on Fig. 4 from Ritz *et al.* (2012).



Figure 2. The Río Tambo near to the village of Yunga at 3500m

but all predominately spineless. Several segments clearly have persistent leaves, a feature which is not so obvious or pronounced in members of the genus *Cumulopuntia*, although is seen in some opuntoid taxa, particularly in the genus *Austrocylindropuntia*. I had never encountered anything like the illustrated plant during my field work in Peru and wondered what it could be. In the text Daniel reported that the plant grows at Ichuña, a small village in the upper reaches of the Río Tambo at 3580m.

After studying the literature, the closest match I could find to the plant illustrated by Daniel was *Austrocylindropuntia verschaffeltii*. For example the illustration in Iliff (2002, fig. 40) appears a very good fit for the vegetative characters of the plant illustrated in *Quepo*. Could *Austrocylindropuntia verschaffeltii*, which presently is only recorded from Bolivia and Argentina, also grow in Peru and be included in the national flora?

***Tephrocactus* or *Austrocylindropuntia*?**

The possible sighting of *Austrocylindropuntia verschaffeltii* in Peru was of particular interest to me because at the time *Quepo* 24 was published I was collaborating on a molecular study of Andean

opuntoids which included this species. The study, now published (Ritz *et al.*, 2012), shows that *Tephrocactus* is a monophyletic genus with good statistical support only if *Austrocylindropuntia verschaffeltii* is included. *Tephrocactus nigrispinus*, a puzzling species whose generic placement has been questioned for some time, is shown to be a sister species to *Austrocylindropuntia verschaffeltii*. Based on the results of the molecular study the new combination *Tephrocactus verschaffeltii* was formally published by Hunt & Ritz (Hunt, 2011).

The genus *Tephrocactus* has in the past been used as a genus to include many of the Andean opuntoids but recently there has been a move to a larger number of more tightly defined genera. Today, *Tephrocactus* is restricted to just a small group of predominately Argentinian species mainly found on the eastern side of the Andes at relatively low altitudes (usually below 2000m). Friedrich Ritter (Ritter, 1980) was an early proponent of this narrow circumscription of *Tephrocactus*. It has since been followed with minor modifications by others (Kiesling, 1984, Gilmer & Thomas, 1998, Hunt *et al.*, 2006). Seed characteristics (Stuppy, 2002) have been important features for the delineation of the various segregate



Figure 3. The habitat of *Tephrocactus verschaffeltii* in Peru at 3660m



Figure 4. *Tephrocactus verschaffeltii* PH1027.04 - an example of a large clustering plant.



Figure 5. *Tephrocactus verschaffeltii* PH1027.04



Figure 6. *Tephrocactus verschaffeltii* PH1027.04 - a small plant with small rounds segments and unfertilized flower.



Figure 7. Three segments of *Tephrocactus verschaffeltii* PH1027.04. showing variation — left spineless, middle spineless but with leaves and right with spination.

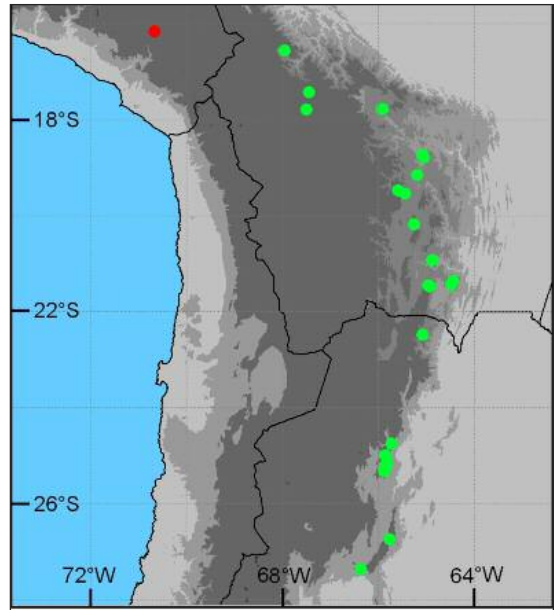


Figure 8. *Tephrocactus verschaffeltii* GC429.02 in habitat with *Cumulopuntia boliviana* at Escoipe, Salta, Argentina at 3110m. Photograph: Graham Charles.



Figure 9. *Tephrocactus verschaffeltii* GC441.03 in habitat north of Nazareno, Salta, Argentina at 3400m. Photograph: Graham Charles.

genera of Andean opuntioids and have been supplemented by molecular studies (Wallace & Dickie, 2002, Griffith & Porter, 2009, Ritz *et al.*, 2012). Fortunately, the results have been broadly in alignment, although neither *Tephrocactus nigrispinus* nor *T. verschaffeltii* fit comfortably within the genus *Tephrocactus* when only seed characteristics are considered.



Map 1. Geographic distribution of *Tephrocactus verschaffeltii*. Green dots show Argentina and Bolivia populations and red dot shows the Peruvian population. Country boundaries (black lines) are included for Argentina, Bolivia, Chile and Peru. Data for Bolivia and Argentina locations is provided by Martin Lowry.

Tephrocactus nigrispinus was originally described as *Opuntia nigrispina* by Schumann in 1898 and the combination *Tephrocactus nigrispinus* was made as early as 1936 by Backeberg but it was not generally accepted by other authors. Ritter (1980) placed it in his genus (Platy-)Opuntia although possibly mixed up his material with a *Tunilla* species (Illiff, 2002). Kiesling (1984) considered it a *Maihueniopsis* whilst Illiff (2002), without making any nomenclatural changes, placed it in an informal monotypic group 'nigrispina'. Hunt *et al.* (2006) accepted the taxon as a *Tephrocactus* but only as a “least worst option”.

Tephrocactus verschaffeltii has had a rather more settled taxonomic history. It was described as *Opuntia verschaffeltii* by Weber in 1898 and it had been considered an *Austrocyllindropuntia* by most authors since publication of the combination by Backeberg in 1939. However, Stuppy (2002) questioned this placement and remarked that the seed structure is rather alien for the genus. Illiff (2002) also places it in an informal monotypic group “verschaffeltii”.

Figure 1 shows the relationships between the segregate genera in Tribe Tephrocactae with *Tephrocactus* expanded to show 9 species in 4 species groups. The data is derived from figure 4 in Ritz *et al.* (2012) and is based on combined ma-



Figure 10. *Lobivia pampana*? PH1027.01

ternal (*trnK*/*MatK* region) and paternal (*phyC* exon 1 region) molecular sequences.

Both *Tephrocactus verschaffeltii* and *T. nigripinus* grow at higher altitudes than the other *Tephrocactus* species so perhaps have evolved characters more suitable to alpine habitats. However, the divergence of seed characters, which are usually more conserved, is a mystery. Recently, Guiggi (2011, 2013) has proposed two new monotypic genera (*Banfiopuntia* & *Pseudomaihueniopsis*) for these two distinctive species but they are not supported by the molecular data and would leave *Tephrocactus* as a paraphyletic genus if *Tephrocactus verschaffeltii* and *T. nigripinus* were removed.

Searching in Peru

I was determined to investigate the possible sighting of *Tephrocactus verschaffeltii* in Peru so, at the next available opportunity to visit southern Peru during March 2012, I attempted to reach Ichuña in the upper reaches of the Río Tambo from the town of Moquegua. Heavy rains but mainly a lack of time thwarted my efforts.

In April 2013, accompanied by a friend from England, I made a second attempt to visit the area, this time trying the route from Arequipa. After taking the highway in the direction of Juliaca, we turned off onto a dirt road that crossed the vast altiplano desert at over 4000m altitude, populated with grazing Vicuña, before descending down to the Río Tambo near the village of Yunga.

We headed a little upstream towards Ichuña before stopping near the confluence of the Río Ichuña and Río Paltutire which join to form the Río Tambo at this point. The particularly steep and rocky valley sides are difficult to access but fortunately a good footpath descended down to the river and a footbridge allowed us to cross. We soon found a *Lobivia* species (possibly *L. pampana*) (Figure 10), *Cumulopuntia ignescens*, *Tunilla soehrensii* and some very attractive specimens of



Figure 11. *Neowerdermannia chilensis* ssp. *peruviana* PH1027.03

Neowerdermannia chilensis (ssp. *peruviana*) (Figure 11). *Tephrocactus verschaffeltii* eluded us until, with the sun falling behind the rim of the valley and leaving us in deep shade, we nearly gave up our search before encountering a single small plant growing right by the side of the path. Below a steep rock face we scrambled up a steep hillside covered in grasses where we found several larger plants growing. It was clear we had found our quarry, as illustrated in *Quepo*, growing at 3600m.

The plant had two distinct types of segment. The first type formed the main structure of the plant and was as long as a finger but thicker and slightly tuberculate. Most segments of this type were spineless but a few had one or two flexible white spines per areole. Those segments that had spines carried them on the majority of areoles and tended to be larger and situated towards the base of the plants. The segments had dried remains of the persistent leaves which had recently shrivelled up at the end of the rainy season. The second type of segment formed on the extremities of the larger segments (acrotonic branching) and was much smaller, almost spherical, reddish in colour and quite easily detached. They also had dried up remains of small leaves and were always spineless. Further examples were found separated from the plant and lying on the ground.

Flowering appeared to be rare and only very few flower remains were observed, none of which had been fertilized (Figure 6). Perhaps this population relies on the dispersal of the small and easily detached spherical segments rather than seed for propagation, as seen in other opuntioids such as *Cumulopuntia leucophaea* (*C. sphaerica*).

I think this plant matches well with examples of *Tephrocactus verschaffeltii* described and illustrated in the literature. The two distinct segment types are an unusual feature, perhaps unique to this species. I have yet to see flower, fruits or

seeds of the Peruvian population but assume they will fall within the natural range of the species. Flowers are reported to be red to orange with a deep purple stigma.

The distribution map (Map 1), with find spots (in green) kindly supplied by Martin Lowry for localities in Bolivia and Argentina shows the range of *Tephrocactus verschaffeltii* which stretches from approximately S27.5° to S16.5°. The Peruvian locality (red spot) is approximately 400km distant from the nearest other known population. This is a significant distance but less so when you consider the overall distribution covers approximately 1200km of the Andes. Perhaps more noteworthy is the fact the Peruvian population is the only one to be found on the Pacific side of the watershed rather than the Atlantic side.

Acknowledgements

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