

The identity of *Oxalis megalorrhiza* – a 300-year puzzle

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The true identity of *Oxalis megalorrhiza* is finally revealed. Photos as indicated.

Summary

Oxalis megalorrhiza Jacquin (1794) is based on an illustration by Feuillée (1714) of a plant with large swollen roots that was collected in southern Peru (Moquegua). It is not the same as the plant from Valparaíso, Chile, which is in cultivation under either that name or as *O. carnosa* and naturalised on the Isles of Scilly, for which the earliest available name is *Oxalis mirbelii* Dernhardt (1839). *Oxalis rubrocincta* Lindley (1842) is not a synonym of *O. megalorrhiza* nor is it from Guatemala, but from Peru, and is possibly conspecific with *O. atacamensis* Reiche (1894).

Introduction

In 1714 the French explorer Louis Feuillée published an illustration of an *Oxalis* he found in Peru, giving it a pre-Linnaean polynomial, *Oxys luteo flore, radice crassissima*, meaning yellow-flowered *Oxalis* with the thickest roots. (This *Oxalis* was published in volume 2 (Feuillée, 1714)). Recent authors (Lourteig, 2000; Heibl, 2005) cite 1725, which was the date for volume 3.) Subsequently, along with *Gunnera tinctoria* and



Fig. 1 *Oxalis carnosa*. Edwards's Botanical Register 13: t.1063



Fig. 2 *Oxalis carnosa*. Curtis's Botanical Magazine 55: t.2866



Fig. 3 *Oxalis carnosa*. Loddiges's Botanical Cabinet 17: t.1647

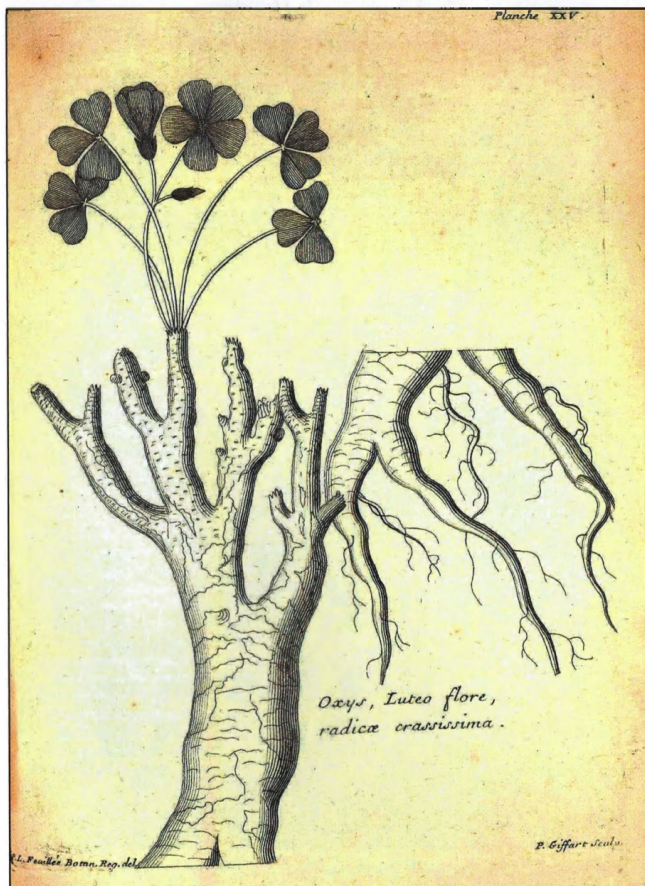


Fig. 4 Feuillée's drawing from Journal des observations, 2: t. 25

several other taxa, it was overlooked by Linnaeus. In 1794 the Austrian botanist and *Oxalis* enthusiast Nikolaus Joseph Jacquin named Feuillée's plant *Oxalis megalorrhiza*.

John Lindley (1799-1865), a London based botanist closely connected with the Horticultural Society of London (later to become the Royal Horticultural Society), misidentified a cultivated introduction brought from Valparaíso, Chile by James Macrae in 1825 as *O. carnosa* Molina (Lindley, 1827) (Fig. 1). In this, he was followed by Hooker (1828) (Fig. 2). About two years later an illustration of a plant from the same source revealed it had developed the familiar aerial stem (Loddiges, 1830) (Fig. 3). Subsequent botanists accepted this application of the name, with some such as MacBride (1949) in his epic *Flora of Peru*, using *O. megalorrhiza* with *O. carnosa* as a synonym. Ten years later Dandy & Young (1959) applied the name *Oxalis megalorrhiza* to the plant from Valparaíso, Chile, currently in cultivation and naturalised on the Isles of Scilly, where it was introduced, according to Tresco Abbey garden records, in 1894. However, there is a painting of a group of plants that includes this *Oxalis* (as *O. crassifolia*) by a Tresco resident dated 1879 that is reproduced by King (1985: 71, painting



Fig. 5 A collection from amongst *Tillandsia* and giant cacti in lomas at 900m, Arequipa, Peru, R.M.Straw 2277 (US), of a plant very similar to Feuillée's drawing. Lourteig determined it as *O. pachyrrhiza*, and cites it as Strand 2277

no 7), suggesting that there was an earlier introduction under another name. Knuth (1930) chose to use the name *O. carnososa* and included *O. megalorrhiza* as a synonym. Recent authors have continued to apply *O. megalorrhiza* to the Chilean introduction (Lourteig, 2000; Heibl, 2005; Stace, 2019).

Perplexity emerges

However, Dandy & Young (1959) of their own admission encountered “a perplexing point”. The plants to which they applied the name *O. megalorrhiza*, did not quite match the description by Feuillée or Jacquin, whose plant had leaves with violet undersides. Collections from the type locality would be useful here. Feuillée gives his collecting locality as “Les montagnes du Perou, a deux lieues du bord de la mer, & a 17° 40’ de latitude du Pole Austral.” Lourteig (2000) identifies this with Valle del Ylo [Ilo], Moquegua, Peru. Deux lieues (two leagues) is about 11 kilometres or six miles depending on which estimate – nautical or pedestrian – of a league is used, not far inland from the coast and likely in Lomas vegetation. (Lomas are areas of fog-watered vegetation in the coastal desert of Peru and northern Chile.) However, four months after Feuillée returned to France in 1711, Louis XIV dispatched

Amédée-François Frézier to South America. Frézier disagreed with several of Feuillée’s determinations of the latitudes and longitudes of South American locations, even discovering some mistakes. Perhaps Feuillée’s locality should be regarded as approximate.

Herbarium specimens of *Oxalis* from this area do not resemble the Chilean plant, but agree with Feuillée’s drawing, which depicts a plant with short aerial stems but massive swollen roots (Fig. 4). On the plant he delineated one can estimate the soil level at the point where the small leaf scars – Feuillée called them gersée, meaning chapped – on the stem end, and slightly above the branching of the aerial stems. The basal cut off in the 1714 illustration is simply to fit it on the page, not to illustrate soil level. Most of the mass of genuine *O. megalorrhiza* is subterranean, whereas most of *O. “carnososa”* is above ground, at least in mature plants. Subsequently, collections from Peru in which petioles, pedicels and leaf undersides are suffused with a dark maroon-purple pigment have also been found.

Lourteig (2000) correctly identifies the type locality, but in her treatment does not list any specimens of *O. megalorrhiza* from Moquegua at all, which is very suspicious. Instead they are listed under her concept



Fig. 6 *O. mirbelii* (Photo: Julian Shaw)



Fig. 7 Plant encountered in Peru with the habit of *O. mirbelii*, and hairy leaf undersides may be without a name (Photo: Al Laius)



Fig. 8 *Oxalis rubrocincta*. Edwards's Botanical Register 28: t.64

of *O. pachyrrhiza*. Hence, she has included many of the records for the large-rooted coastal Lomas *Oxalis* under *O. pachyrrhiza* (Fig. 5), when in fact among them is the genuine *O. megalorrhiza*. Part of the problem with identification is that subterranean parts and flowers are often missing from collections, and most species gradually develop a similar looking aerial stem, which along with a few broken leaf fragments is often all that is available. The name *Oxalis pachyrrhiza* Weddell (1861) was based on a high-altitude collection (4,000m) from Peru and remains available for such plants.

Heibl (2005) provides a molecular phylogeny inferred from *trnL* and *psbA* plastid sequences. The analysis resolved Chilean samples of Section *Carnosae* into a northern and a central Chilean clade in which *Oxalis* "*megalorrhiza*" from Valparaíso clusters with *O. tortuosa*. In the northern clade, the remaining species are poorly separated and mostly form a polytomy. This result suggests that it is anomalous to typify the *Oxalis* "*megalorrhiza*" from Valparaíso with a plant from Peru, north of the Atacama Desert.

What name for the Chilean plant in cultivation?

Since the next chronologically available name *O. bicolor* Savigny (1797) is a homotypic synonym of *O. megalorrhiza* it has no application to the Chilean plant.

The earliest available name is *O. mirbelii* Dernhardt (1839) which was neotypified (Lourteig, 2000: 343) on a cultivated plant at Vienna (W), so it is the name we should be using for the Chilean plants previously identified as *O. megalorrhiza* or *O. carnosae*. Lourteig (2000) refers to her choice as a lectotype but as the sheet at W is dated 1853, and *O. mirbelii* was published in 1839, the specimen would not have been available to Dernhardt then, making her designation a neotype.

Synonymy

O. mirbelii Dernhardt (1839), Chile. Common in cultivation.

Syn. *O. succulenta* Barnéoud (1845); *O. reticulata* Steudel (1856); *O. arborescens* hort. ex Turcz. (1858); *O. tarapacana* Phil. (1891); *O. illapelina* Phil. (1893); *O. brevis* Phil. (1893); *O. paniculata* Reiche (1894); *O. borchersii* Phil. (1893); *O. darapskyi* Phil. ex Reiche (1894).

O. megalorrhiza Jacq. (1794), Peru. Not known to be cultivated.

Syn. *O. bicolor* Savigny (1797).

Oxalis mirbelii (Fig. 6) is the only member of Section *Carnosae* known to be self-fertile, as evinced by its rapid spread from seed. However, talking to growers, there are reports of plants that do not set seed unless cross-pollinated, but otherwise appear similar to those that do. Based on my own experimental crosses I found that *Oxalis* hybrids are either completely sterile with aborted pollen, or become self-fertile as the complex tristylous system breaks down. Hence, I suspect that *O. mirbelii* contains more than one race in the wild, and the self-fertile seeding variant so common in cultivation is possibly the result of introgression with another member of Section *Carnosae*.

O. megalorrhiza var. *hirta*

Knuth (1930) further complicated the situation when he described a Peruvian plant with hairy leaf undersides as *O. megalorrhiza* var. *hirta*. Examination of a surviving isotype specimen at Harvard's Gray Herbarium reveals that this plant is not similar to *O. megalorrhiza* or *O. mirbelii*, but seems closest to *O. bulbocastanum* Phil., a predominantly Chilean species that also occurs in Arequipa and Tacna, Peru.

However, var. *hirta* differs by the hairy petioles and leaf undersides, and also the stem with attached petiole bases, which evidently continued underground to a tuber where it was detached when collected. The sepal shape also recalls *O. sepalosa* Diels, but this differs in other characters. Consequently, a new name is provided for this plant.

Oxalis mollendoensis J.M.H.Shaw stat. & nom. nov.
Replaced synonym: *Oxalis carnos*a var. *hirta* R.Knuth, Pflanzennr. (Engler) IV. 130 (Heft 95): 186 (1930).

Synonyms: *Oxalis megalorrhiza* var. *hirta* (R.Knuth) J.F.Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13, pt. 3: 574 (1949). *Oxalis bulbocastanum* subsp. *hirta* (Knuth) Lourteig, Bradea 7(2): 356 (2000), type cited as Johnston 6281 in error.

Type: Johnston 6291, GH, (HUH 00106658). S. Peru, Arequipa, Mollendo, hillside directly back of port. 16 Oct 1925.

<https://s3.amazonaws.com/huhwebimages/0DDEBCE8399D45C/type/full/106658.jpg>

Plants encountered in Peru with the habit of *O. mirbelii* and hairy leaf undersides do not belong here and are currently without a name (Fig. 7).

A further twist – *Oxalis rubrocincta*

Interestingly the next name often listed as a synonym of *O. megalorrhiza* or *O. carnos*a is *O. rubrocincta* Lindley (1842) (Fig. 8) described from cultivated plants derived from a collection by Karl Hartweg. Knuth (1930) appears to be the first to synonymise it and that has been accepted without question ever since. At the time of its description, it was assumed that the plants originated from Guatemala, an error that has persisted in the literature. *Flora of Guatemala* (Standley & Steyermark, 1946) noted it was recorded erroneously for Guatemala, and cited Knuth (1930) who regarded it as a synonym of *O. carnos*a Molina, from Andean South America. Lourteig (2000) observed Guatemala must be an error for Chile or Peru, and synonymised it under *O. megalorrhiza*.

Karl Theodore Hartweg (1812-1871) had been engaged by the Horticultural Society of London to collect seeds and plants in Mexico, Guatemala and tropical South America in a trip that lasted from 1836 to 1843. It proved to be very successful, resulting in many new introductions to horticulture and several hundred species new to science. A set of Hartweg's herbarium specimens was sent to George Bentham (1800-1884), a botanist at Kew, who published a serialised list of identifications along with descriptions of the new species that became *Plantae Hartwegianae*, completed in 1857. There is no mention in there by Bentham of this *Oxalis* or any of the other plants seen



Fig. 9 A younger plant of *O. megalorrhiza* that has not yet developed stolons (Photo: Oliver Whaley)

by Hartweg in Peru. Bentham's account jumps from the last Guatemalan collection to the first from Guayaquil, Ecuador, entirely omitting the three-week interval in Peru. Yet there must have been some collection made probably towards the end of 1840 or early 1841, for the seeds or plants to be cultivated later in London, and in flower by September 1841 (Lindley, 1842). According to McVaugh (1970) Hartweg arrived in Callao, Peru about 8 February 1841 after a passage of 36 days by sea from Realejo, Nicaragua. He left Callao on 3 March 1841 by ship arriving in Guayaquil 13 March 1841.

It appears to have been overlooked that Hartweg (1848) himself provided an account of his travels in which he related the discovery of *O. rubrocincta*, as follows: "I landed at Callao [now the port area of Lima] on the coast of Peru. Having stopped here for a few days, I made an excursion from Lima towards Acobamba. This is situated in the Cordillera, which rises behind the capital and which attains its highest point at the Toldo de nieve, (tent of snow), being a broad sheet of perpetual snow visible from Callao. The lower part of this Cordillera, and indeed the whole coast of Peru, from the total absence of rain, presents a most desolate appearance, and the eye in vain searches for a green spot for relief. Entering the ravines, I observed a few plants of *Cereus senilis* [*Espostoa melanostele*] and another tall growing species [*Trichocereus cuzcoensis* or *Weberbauerocereus weberbaueri*]; the former however seldom attains more than 10 feet in height, nor has it the long white hairs with which that species is covered in Mexico. Near the solitary bluff rock, called Paucacha, which is barely within the influence of the periodical rains, I found a beautiful bright orange-flowered *Tacsonia* [probably *Passiflora mixta*], also *Oxalis rubrocincta*, *Berberis*



Fig. 10 Excavated plant of *O. megalorrhiza*, Ica province, Peru. Note the very large storage roots, and also subterranean stolons that gradually form clumps. These likely account for descriptions of 'horizontal rhizomes' (Photo: Oliver Whaley)

dealbata [*B. flexuosa*], *Colletia horrida* [*C. spinosissima*], and a *Hesperomeles* [*H. cuneata* or *H. weberbaueri*] with long thorns."

This information locates *O. rubrocincta* between Lima and Acobamba near Paucacha, possibly in Lomas vegetation in the Rímac valley, far removed from Guatemala.

After comparing the plate in *Edwards's Botanical Register* with the excellent images in Christoph Heibl's thesis (2005) I concluded that *O. rubrocincta* is very close to, and possibly conspecific with *O. atacamensis* Reiche. The only differences I could see were the deflexed immature fruiting pedicels in *O. atacamensis* (upright in *O. rubrocincta*) and the strongly exerted anthers in *O. rubrocincta*, but it is evidently a short-styled plant, as opposed to a long-styled morph. However, I have yet to examine the type at CGE. If they prove to be conspecific, this would disrupt the current nomenclature as *O. rubrocincta* of 1842 would have priority over *O. atacamensis* of 1894.

Oxalis Section *Carnosae*, to which all the taxa discussed here belong, is a well-supported, distinct lineage, (Heibl, 2005; Heibl & Renner, 2012) comprising an as yet unknown number of local endemic succulent species that appear along the coast of Chile and Peru, reaching into Ecuador and Galapagos, many of which remain to be investigated and re-found. The most recent appraisal was by Heibl (2005), focusing on the Chilean taxa, who described a new species from Northern Chile (Heibl & Marticorena, 2008). There is a parallel situation with the coastal species of *Cistanthe*

and *Nolana* that occupy a similar range and continue to be the object of painstaking botanical investigation. The species of Section *Carnosae* appearing on the northern side of the Atacama in Peru have not been so intensively investigated.

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