

## Additions and Corrections to the Taxonomy of “*Cistanthe arenaria*” (Montiaceae)

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### ABSTRACT

This work provides corrections and additions to a previously published taxonomy of Chilean plants classified as *Cistanthe arenaria* (Cham.) Carolin ex Hershk. The identity of *Calandrinia bracteosa* Phil. is discussed. Errors and omissions involving a table, figures and figure captions, and measurement are reported.

**Key words:** *Cistanthe*, Montiaceae, Chile

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### Introduction

Herskovitz (2022a, 2022b) published a revised taxonomy of plants historically and currently classified in and/or identified as *Cistanthe arenaria* (Cham.) Carolin ex Hershk [*C. sect. Rosulatae* (Reiche) Hershk.; Montiaceae]. The work segregated from this south-central Chilean species four distinct species of north-central Chile. The current inclusion of the north-central Chilean species in *C. arenaria* owed to errors and omissions in the taxonomic literature that were reproduced for nearly two centuries. The present work corrects errors and omissions in Herskovitz (2022a), none of which compromise the taxonomic conclusions of that work. The most substantial omission is my earlier mention (Herskovitz, 2019a) of *Calandrinia bracteosa* Phil. as a possible synonym of *C. arenaria*, which I reject here. Additional errors and omissions involving a table, figures and figure captions, and measurement are reported.

#### 1. The identity of *Calandrinia bracteosa* Phil.

Herskovitz (2019a) reported that *C. bracteosa*, described from Chillán<sup>1</sup> (Ñuble Region; *M. Solis s.n.*) possibly pertained to *C. arenaria* sensu Herskovitz (2022a), but this name was not mentioned in the latter work. The reason? Out of sight, out of mind. Herskovitz (2019a) discussed the taxonomy of *Cistanthe* sect. *Cistanthe*, not *C. sect. Rosulatae*. But Philippi (1893) classified *C. bracteosa* in the former (effectively). Philippi discussed species historically confused with *C. arenaria* in a discontinuous continuation of the same work (Philippi, 1894 [“1893”]). Reiche (1898a, b) followed Philippi’s sectional classification, but, for reasons not explained, he considered *C. bracteosa* to be a synonym of *Calandrinia speciosa* Lehm. Herskovitz (2019a) discussed the taxonomy of the latter untypified name and concluded that its taxonomic identity could not be ascertained. But this is why *C. bracteosa* was discussed in that work. I had forgotten about this name when I prepared Herskovitz (2022a), because taxonomic references to *C. sect. Rosulatae* did not mention this name.

The GBIF (GBIF Secretariat, 2017) and POWO (POWO, 2023) databases currently list *Calandrinia bracteosa* as an accepted species of *Calandrinia* and not *Cistanthe*. The Flora Cono Sur database (without year) lists *Calandrinia bracteosa* as a “doubtful name.” This means that its status as a

<sup>1</sup> Misspelled “Chillan” in Herskovitz (2022a).

distinct species is doubtful, because the validity of the name and its protolog/description cannot be in doubt. Rodriguez et al. (2018) did not mention this name. Ford[-Werntz] & Peralta (2002) listed *C. bracteosa* among those combinations in the precladistic circumscription of *Calandrinia* Kunth that pertain to *Cistanthe* Spach. This follows, of course, from Philippi's (1893, 1894 ["1893"]) and Reiche's (1898a, b) sectional taxonomy of *Calandrinia* as parsed by later cladistic taxonomies (currently Hershkovitz, 2019b).

My 2019 diagnosis of *C. bracteosa* as possibly *C. arenaria* was based partially on my superficial reading of the protolog and description of a herbarium specimen (Philippi, 1893) and partially on its provenance. I had not seen the Type, and Gloria Rojas (SGO) has advised me that she could not locate the specimen in SGO.<sup>2</sup> But *C. arenaria* was the only species of *Cistanthe* whose presence in Chillán I had confirmed. The most southerly distributed species of *C. sect. Cistanthe* is *C. mucronulata* (Meyen) Carolin ex Hershk., whose distribution I had confirmed between the precordillera in the O'Higgins and Maule Regions southeasterly towards the coast of the Ñuble and Biobío Regions (Hershkovitz, 2022a). I had not seen records from the interior of the Ñuble Region.

I based my earlier diagnosis mainly on the morphological dimensions given by Philippi (1893; stem thickness, stem length, leaf/petiole length, etc.). All of these were rather larger than those for *Calandrinia solisi*<sup>3</sup> Phil. (= *C. arenaria*; see below), also from Chillán (*Solis s.n.* [SGO, image!], but within the range of plastic variability that I have documented for other species of *C. sect. Rosulatae* (see Hershkovitz, 2022a). Just as importantly, the dimensions were rather smaller than those I have observed for the perennial *C. mucronulata*.

The growth form of *C. arenaria* is not established, but the roots can be rather thick for an annual and the base of the stems somewhat woody (Hershkovitz, 2022a). Philippi (1893) described *C. bracteosa* as suffrutescent, thus woody at the base. He did not describe the roots, so I suspect that these were lacking in the specimen. He described the sepals as 8 mm long, and the petals as "perhaps not much longer." Also, he remarked that the leaves of *C. bracteosa* were nearly the same as those of *C. arenaria*, viz. overall oblanceolate, but having a rhombic blade portion distinct from a tapered petiole portion. The described leaf dimensions (38 x 22 mm length/width) are rather large for *C. arenaria*, especially the width. But under "luxuriant" conditions, such dimensions might be achieved. At the same time, these dimensions and leaf form are not characteristic of "normal" plants of *C. sect. Cistanthe*. Unfortunately, Philippi (1893) did not describe the fruit or seeds of *C. bracteosa*, suggesting that the specimen was immature. Seeds of *C. arenaria* are glabrous (Hershkovitz, 2022a) and of *C. mucronulata* hairy, so this would have distinguished the species easily.

Nonetheless, reexamination of Philippi's (1893) protolog and description of *C. bracteosa* suggests that it is more likely *C. mucronulata* than *C. arenaria*, although the weedy *C. grandiflora* (Lindley) Schltld. cannot be ruled out (see below). In particular, Philippi (1893) described the inflorescence bracts as nearly orbicular and broader than long, thus effectively somewhat reniform. This form is characteristic of *C. mucronulata* (Meyen, 1834) and species of *C. sect. Cistanthe* in general. Bracts of *C. arenaria* are ovate. Also, Philippi (1894 ["1893"]) accurately described the sepals of *C. solisi* (viz. *C. arenaria*) as almost membranous with black veins. Philippi (1893) did not describe the sepal texture or coloring of *C. bracteosa*, which suggests that the sepals did not have these conspicuous traits. The sepals of *C. mucronulata* are herbaceous, but, at least when fresh, have conspicuous black streaks and blotches. But these are not always distinct in herbarium specimens in cases in which the entire specimen turns rather black.

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<sup>2</sup> Correspondence, Aug 2023.

<sup>3</sup> Misspelled "*solisi*" in Hershkovitz (2022a).

Thus, Philippi's (1893) description of *C. bracteosa* has characteristics of both *C. arenaria* and *C. mucronulata*, but lacks description of the seed trait that would distinguish them easily. The traits most troublesome in the case of *C. mucronulata* are the leaf size and shape and the short petals. In well-developed *C. mucronulata* plants, the leaves are obovate to ovate to broadly ovate, perhaps 50–60 mm long. A petiole is indistinct or very short. Mature petals of *C. mucronulata* are usually 15–20 mm long. However, up to half of this length is achieved essentially during anthesis. But in other species of *Cistanthe*, I have observed that leaves and flowers of water- and/or light-limited plants appear different than those of plants growing under “optimal” conditions [e.g., in *C. vicina* (Phil.) Carolin ex Hershk.; see Hershkovitz (2022a)]. The leaves can be much narrower than normal and the flowers smaller. I am inclined, therefore, to afford greater weight to the less plastic bract morphology and interpret *C. bracteosa* as a “stunted” individual of *C. mucronulata*.

If *C. bracteosa* is *C. mucronulata*, then it extends to both the south and east the (former, if not current) documented distribution of the latter, but not radically. GBIF lists two herbarium specimens<sup>4</sup> from the precordillera ca. 40–50 km east of Linares (Maule Region). This is ca. 120 km northeast of Chillán. GBIF also lists 14 iNaturalist.org observations with photos of robust and lush individuals,<sup>5</sup> mostly from oceanside slopes in the vicinity of Talcahuano (Biobío Region). This is ca. 100 km west-southwest of Chillán.

However, the locality “Chillán” given by Philippi (1893) is imprecise. It probably refers to some locality in the same administrative region as Chillán rather than within the municipality. The specimen was collected by Manuel Antonio de Solís Obando, who collected in this region in the 1860s.<sup>6</sup> At that time, Chillán was situated in the northwestern quadrant of the Department of Chillán (Ñuble Province), an oblong administrative area stretching some 150 km longitudinally and 100 km latitudinally (Rivas Maldonado et al., 2018). The western two thirds of this area, which includes Chillán city, is low elevation (mostly 100–200 m). The eastern third ranges from precordillera to high Andes, there topping out at 2000–3000 m.

Most likely, *C. bracteosa* originated from the western, low elevation sector, as 19<sup>th</sup> Century collectors, including Solís, referred to the mountainous region as “Cordillera de Chillán.” But in summer, the temperatures in the western section often exceed those of Santiago and even Copiapó in the middle of the Atacama Desert. Meanwhile, *C. mucronulata* mainly occurs at somewhat higher precordillera elevations or along the coast. The only place I have observed it “crossing” central Chile's central valley is along the broad floodplain of the Río Mataquito, east of Curicó (Maule Region). Here, high temperatures are mitigated by marine breezes. This might explain the near absence of *C. mucronulata* in the Chillán vicinity, as well as its stunted form (as in *C. bracteosa*) when it occurs.

I suggested above that, alternatively, *C. bracteosa* might have been a stunted waif of *C. grandiflora*, a weedy polymorphic species distributed from (often disturbed or ruderal) coastal areas at c. 33S (Valparaíso Region) northwards to at least 24S (Antofagasta Region), extending towards the precordillera in the Coquimbo and Atacama Regions. I have seen also photos of probable *C. grandiflora* from the international road along the Laguna del Maule reservoir (Maule Region), where the landscape is massively modified. Like most weedy species, plants of *C. grandiflora* might appear essentially anywhere that they can complete their life cycle, though they might not naturalize.

<sup>4</sup> 21 Jan 1988 (*Ford 431* [MO]); 21 Jan 1993 (*Taylor 11007* [MO]).

<sup>5</sup> These all are misidentified as *C. grandiflora*. [https://www.gbif.org/occurrence/search?geometry=POLYGON\(\(-73.39531%20-36.97194,-72.81099%20-36.97194,-72.81099%20-36.56292,-73.39531%20-36.56292,-73.39531%20-36.97194\)\)&has\\_coordinate=true&has\\_geospatial\\_issue=false&occurrence\\_status=present&taxon\\_key=7952030](https://www.gbif.org/occurrence/search?geometry=POLYGON((-73.39531%20-36.97194,-72.81099%20-36.97194,-72.81099%20-36.56292,-73.39531%20-36.56292,-73.39531%20-36.97194))&has_coordinate=true&has_geospatial_issue=false&occurrence_status=present&taxon_key=7952030)

<sup>6</sup> [https://kiki.huh.harvard.edu/databases/botanist\\_search.php?mode=details&id=17287](https://kiki.huh.harvard.edu/databases/botanist_search.php?mode=details&id=17287) (accessed Aug 2023)

## 2. The Type of *Cistanthe trigona* (Colla) Carolin ex Hershk.

The holotype of *Cistanthe trigona* is identified correctly in Table 1 of HersHKovitz (2022a), but the photo of the specimen in Fig. 1O is the lectotype of *C. arenaria*. The holotype of *C. trigona* is illustrated here in Fig. 1. The error owes partially to reordering of figures from an earlier draft of HersHKovitz (2022a) and partially to the superficial similarity of the Type specimens of the two species. Both lack roots, hence the root morphology that distinguishes them. Of course, the other traits that distinguish the species, petal color and seed surface (HersHKovitz, 2022a), are not visible in herbarium specimens.

## 3. Omissions in synonymy

Among the other errors and omissions in HersHKovitz (2022a), *Calandrinia solisi* was discussed as a synonym of *C. arenaria*, but it was not included in Table 1. The specimen data are: Holotype: CHILE, Ñuble Region, Chillán. 1863. (*M. Solis s.n.* [SGO, image!]).

Unlike HersHKovitz (2020a), HersHKovitz (2022a: Table 1) did not intend to provide a complete list of published names pertinent to the species discussed. It intended mainly to provide a list of all relevant Types, along with the original names of those Types. The table included only one invalid combination, “*Calandrinia venulosa* Hook. & Arn.,” because of the key role of this name and associated specimen in generating two centuries of taxonomic confusion. The confusion continues: POWO (2023) currently lists this name as a pro synonym of *C. arenaria*. It is a pro synonym of *C. chamissoi* (Barnéoud) Carolin ex Hershk. (HersHKovitz, 2022a). But POWO (2023) otherwise accepts the taxonomy of HersHKovitz (2022a, b).

Additional names associated with the discussed taxa can be found in POWO (2023), in turn based on Govaerts et al. (2021). Several, but not all, of the epithets have validly published combinations in *Claytonia* L. These combinations were authored by Otto Kuntze for reasons discussed in HersHKovitz (2021) and otherwise not germane to the taxonomy of these species. Two names listed as heterotypic synonyms of *C. arenaria*, “*Calandrinia racemosa* Steud.” and “*Calandrinia venusta* Steud.,” are nomina nuda. They are not typified, hence cannot be qualified as heterotypic. Steudel (1840 [“1841”]) listed these as published names and taxonomic synonyms of *C. arenaria*. But the names do not appear to have been published in the publications indicated, and their taxonomic identity cannot be verified. They are better considered as “unplaced names.” POWO (2023) also lists “*Calandrinia vinulosa* Walp.” as a heterotypic synonym of *C. arenaria*. This name is a misspelling of the invalid and untypified “*C. venulosa*” mentioned above.

## 4. Errors and omissions in figure references and captions

The figure captions and figure references also include errors. The reference to Fig. 1M–N (p. 16) should read Fig. 1L–M. The Fig. 4 caption lettering is erroneous following that of [4]D, because the following caption is lettered [4]C rather than [4]E. This shifts the letters of all subsequent captions, i.e., the caption letter [4]E should be [4]F and so forth. Also, following [4]G–H, which should be [4]I–J, the first caption is not lettered. This should be [4]I. Note that the *text* references to Figs. 4A–J are all correct, viz. each text reference refers to the correct photo. Only the figure caption is mislettered.

Finally, there is no text reference to Fig. 9. Figure 9 complements Fig. 8, the Type of *Cistanthe fenzlii* (Barnéoud) Carolin ex Hershk. The specimen in Fig. 9 shows the length and thickness of the taproot, which is not evident in the Type.

## 5. Errors as a “rule.”

Several photos in Hershkovitz (2022a) and also Hershkovitz (2022b–d) show a plastic 20 cm ruler or hashes thereof for purposes of scaling. More recently, however, I happened to measure the ruler against a standard and discovered that it is 5% too short, i.e., the 20 cm distance is only 19 cm, and all other hash marks are correspondingly incorrect (Fig. 2). I purchased the ruler from a stationer just prior to my 2022 field work, and it never occurred to me to measure it. In fact, this brand of stationary supplies, Lavoro, is widely distributed in Chile. I suppose that the ruler offers the advantage of making something deficient in length seem longer than it actually is.

During a 2018 excursion, I did not have a ruler. Searching my bag for an alternative, I found a Fox brand filter cigarette, and I used that. Fox cigarettes are sold illegally on the street in Santiago and cost about one fourth that of legal cigarettes. The cigarette appears in photos in Hershkovitz (2018), and the scale bars were calculated directly from the cigarette in the photos. The cigarette itself is 10 cm long and the lines on the paper are spaced 1 mm apart. The accuracy is 99%, which is as good as any inexpensive ruler sold in Chile and obviously much better than the one used in Hershkovitz (2022a). But the cigarette cost much less, and, after using it for a ruler, I smoked it. This is scientific evidence, government propaganda notwithstanding, for the benefits of cigarettes.

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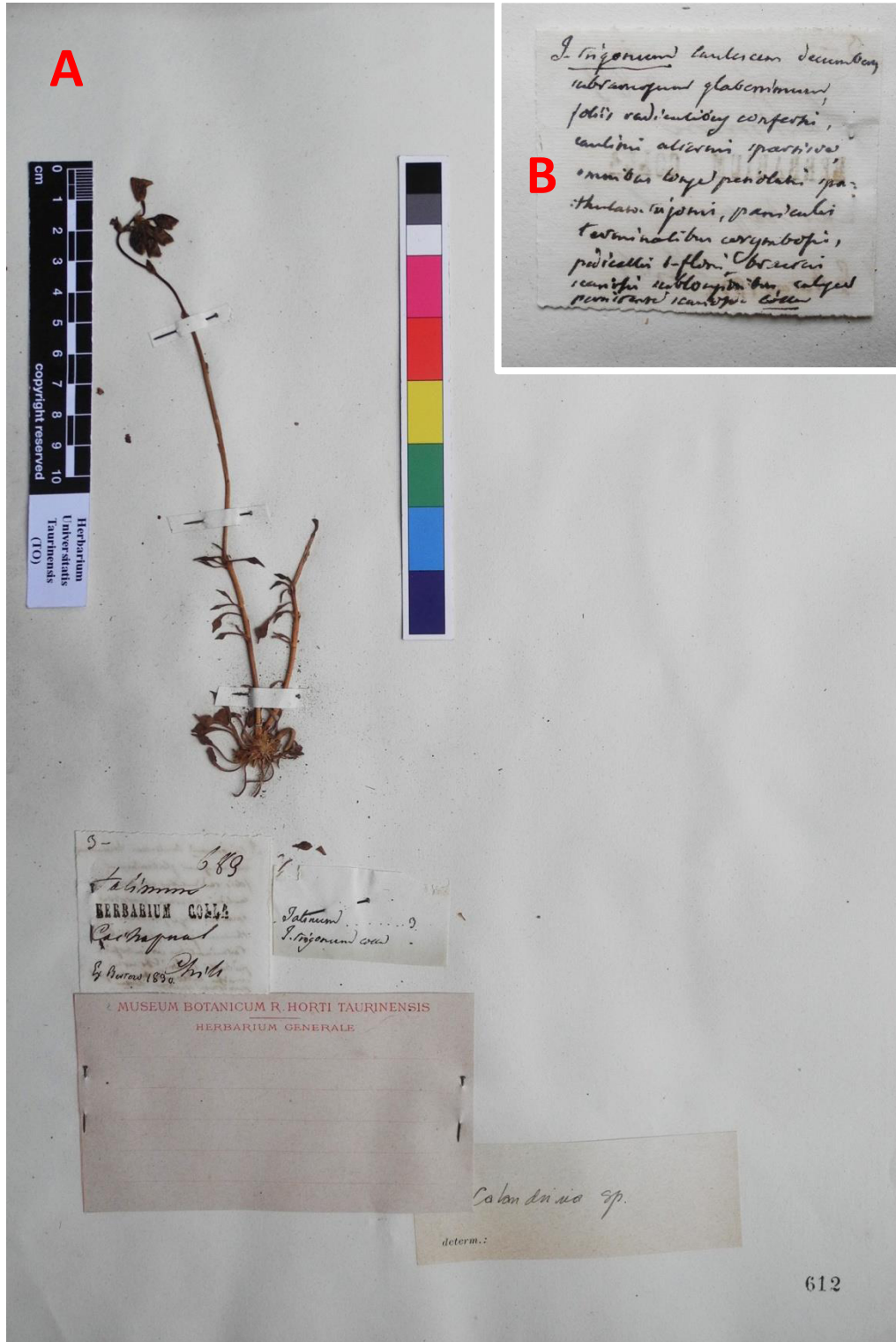
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**Fig. 1.** Holotype of *Talinum trigonum* Colla [= *Cistanthe trigona* (Colla) Carolin ex Hershk.] CHILE: Libertador O'Higgins Region, Rancagua, Río Cachapoal. "1830" [1828!]. Bertero 683 (TO). **A.** Full herbarium sheet. **B.** Colla's text written on the reverse side of the label in A. [See Hershkovitz (2022a: Table 1) for a list of isotypes. Carlo Bertero's Chilean collections are discussed in Hershkovitz (2020b).]





**Fig. 2.** Lavoro brand green plastic 20 cm ruler used for plant measurements and as a scale in photos in Herskovitz (2022a–d). Superimposed on top is a  $\pm$  accurate Fulton's brand clear plastic 20 cm ruler, showing that 20 cm indicated by the Lavoro ruler is only 19 cm.

