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Taxonomic novelties in Nassauvieae (Asteraceae; Mutisioideae) and Montiaceae (Caryophyllales)

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A B S T R A C T :

Recent taxonomic research on different angiosperm lineages and at different taxonomic scales has resulted in the need for new formal taxonomic names. One line of research involves molecular evidence for the phylogenetic relations among genera in the tribe Nassauvieae (Asteraceae; Mutisioideae). Based on this evidence, a new phylogenetic subtribal classification of Nassauvieae is constructed here. Another line of research involves molecular evidence for the phylogenetic relations among the species of the genera Nassauvia Comm. ex Juss. and Triptilion Ruiz & Pav. (Nassauvieae). Based on this evidence, a new phylogenetic sectional classification of Nassauvia is constructed here, and species of Triptilion are renamed as species of Nassauvia. Another line of research involves continuing work on the taxonomy of Montiaceae (Caryophyllales). Species illegitimately named in the genus Silvaea Phil. are renamed in the later homotypic but legitimately named genus Philippiamra Kuntze, and a species named in Calandrinia Kunth is renamed in the genus Cistanthe Spach.

Keywords: Asteraceae, Mutisioideae, Nassauvieae, *Nassauvia*, *Triptilion*, Montiaceae, *Philippiamra*, *Cistanthe*, taxonomy, nomenclature.

1. Introduction

Formal taxonomic revision is a process in which scientific names of organisms are created or changed, not only according taxonomic evidence and criteria, but also according to nomenclatural rules that establish the validity and legitimacy of published names and also maintain their historical traceability in the context of both past and future taxonomic judgment. At the same time, the nomenclatural rules regulate only the validity and legitimacy of the names of taxa. They in no way regulate the operational taxa, taxonomic evidence, or the opinions or criteria of individual taxonomists. The rules only stipulate that names used by a taxonomist must be valid and legitimate, and that they otherwise adhere to the nomenclatural code, especially rules pertaining to nomenclatural priority. Meanwhile, there are both nomenclatural and evidential reasons why taxonomic names are created or modified. Taxonomic research might discover that a name in operational use is either not valid or legitimate, hence that it must be changed. Or it might discover a taxon not previously known to exist and hence needs a name. Names may need to be created or modified according to new evidence concerning existing taxa or according to different taxonomic criteria. An informal but now conventional criterion that emerged since the latest 20th Century is the classification/reclassification of taxa according to (usually molecular) phylogenetic evidence. According to such evidence, I establish in this work a new phylogenetic subtribal classification of the tribe Nassauvieae (Asteraceae; Mutisioideae), and I modify the existing sectional taxonomy of the genus *Nassauvia* Comm. ex Dusén. Consequent to the evidence, I also transfer into *Nassauvia* some species currently classified in *Triptilion* Ruiz & Pav. Then I re-name taxa recently published in the genus *Silvaea* Phil. (Montiaceae), because this generic name is illegitimate, hence the later but legitimate name *Philippiamra* must be used. Finally, I create a new name in the monophyletic genus *Cistanthe* Spach (Caryophyllales; Montiaceae) for a species that had been named only in *Calandrinia* Kunth.

2. Methodology

For each of the lineages that I revise here, I refer to the taxonomic evidence in the Results. All names are constructed according to the rules and conventions of the ICN [1]. Rules for subtribal names are stipulated in Art. 19, for sectional names in Art. 21, and for species names in Art. 23. New names require a valid diagnosis or description and designation of a Type, as stipulated in Articles 38-40. When existing names are recombined or re-ranked, their existing diagnoses/descriptions and Types are transferred to the new name, as stipulated in Art. 41.

3. Results and discussion

3.1. A phylogenetic subtribal classification of the tribe Nassauvieae.

Formerly classified as subtribe Nassauviinae of Asteraceae tribe Mutisieae, Nassauvieae currently is classified as a tribe in the Asteraceae subfamily Mutisioideae [2]. This permits the construction of a new subtribal classification according to phylogenetic evidence reported by [3, 4]. The six subtribes constructed here are relatively small (variously comprising one, two, three, four, five, and six genera). But because of their distributional biases, their

taxonomic names are useful for evolutionary/ecological studies that concentrate on regional diversity. The names are more informative than informal names, such as "Nassauvieae Clade A," etc. For construction of the classification, existing relevant valid/legitimate subtribal names were identified in [5], and these were mapped to clades in the consensus Nassauvieae generic cladogram (Fig. 1). The subtribal classification was constructed first using existing subtribal names and then by creating new names for clades lacking an existing subtribal name. The genera included in each subtribe are listed in the classification. A few genera are classified as Nassauvieae incertae sedis because of inadequate phylogenetic evidence, and one genus currently classified in Nassauvieae was excluded based on more recent phylogenetic evidence [3, 4]. The classification in standard taxonomic notation is as follows:

Asteraceae subf. **Mutisioideae** tribe **Nassauvieae** Cass. (J. Phys. Chim. Hist. Nat. Arts. 88: 198. 1819). TYPE: *Nassauvia* Comm. ex Juss.

Nassauvieae subtrib. **Acourtiinae** Hershk., *subtrib. nov.* TYPE: *Acourtia* D.Don. **Diagnosis**. Herbaceous to suffrutescent Nassauvieae with *Trixis*-type pollen exines, different from other herbaceous to suffrutescent Nassauvieae in having palmately- rather than pinnately-veined leaves [2]. **Genera:** *Acourtia* D.Don, *Burkhartia* Crisci, *Holocheilus* Cass.

This subtribe is sister to subtribe Nassauviinae (Fig. 1) and could be included therein. But I separate these tribes because of their distinct pollen, their growth form (Nassauviinae are mostly herbaceous, while Acourtiinae are mostly woody), and their distribution (Nassauviinae are mostly "Andean/Patagonian," while Acourtiinae are more tropical to subtropical American) [2].

Nassauvieae subtrib. **Nassauviinae**. **Genera:** *Caloppapus* Meyen, *Calorezia* Panero, *Nassauvia* Comm. ex Juss. (incl. *Triptilion* Ruiz & Pav.), *Panphalea* Lag., *Perezia* Lag.

Per ICN Art. 21 [1], this autonymous subtribe automatically establishes whenever other subtribes are segregated from tribe Nassauvieae. Its diagnosis and Type are those of the tribe.

Nassauvieae subtrib. **Polyachirinae** Endl. (Gen. Pl. 489. Jun 1838). TYPE: *Polyachyrus* Lag. **Genera:** *Leucheria* Lag. (incl. *Polyachyrus* Lag.), *Marticorenia* Crisci, *Moscharia* Ruiz. & Pav., *Oxyphyllum* Phil.

Nassauvieae subtrib. **Proustiinae** Hershk., *subtrib. nov.* TYPE: *Proustia* Lag. **Diagnosis.** Shrubby Nassauvieae with *Proustia*-type pollen exines and thorned branches [2, 6]. **Genera:** *Lophopappus* Rusby, *Proustia* Lag.

Nassauvieae subtrib. **Spinoliviinae** Hershk., *subtrib. nov.* TYPE: *Spinoliva* G.Sancho, Luebert & Katinas. **Diagnosis.** Shrubby to arborescent Nassauvieae with *Trixis*-type pollen exines, differing from other shrubby to arborescent Nassauvieae in having relatively shorter style branches that are densely pubescent dorsally throughout their apical half [2, 6]. **Genus:** *Spinoliva* G.Sancho, Luebert & Katinas

Nassauvieae subtrib. **Trixidiinae** Less. (Linnaea 5: 6. Jan. 1830). TYPE: *Trixis* P.Browne. **Genera:** *Ameghinoa* Speg., *Berylsimpsonia* B.L.Turner, *Dolichlasium* Lag., *Jungia* L.f., *Leunsia* Phil., *Pleocarphus* D.Don, *Trixis* P.Browne

Nassauvieae genera *incertae sedis*: *Cephalopappus* Nees & Mart., *Criscia* Katinas.

Excluded genus: *Macrachaenium* Hook.f (transferred to Mutisieae [3, 4]).

Fig. 1 – Consensus generic phylogeny of Nassauvieae

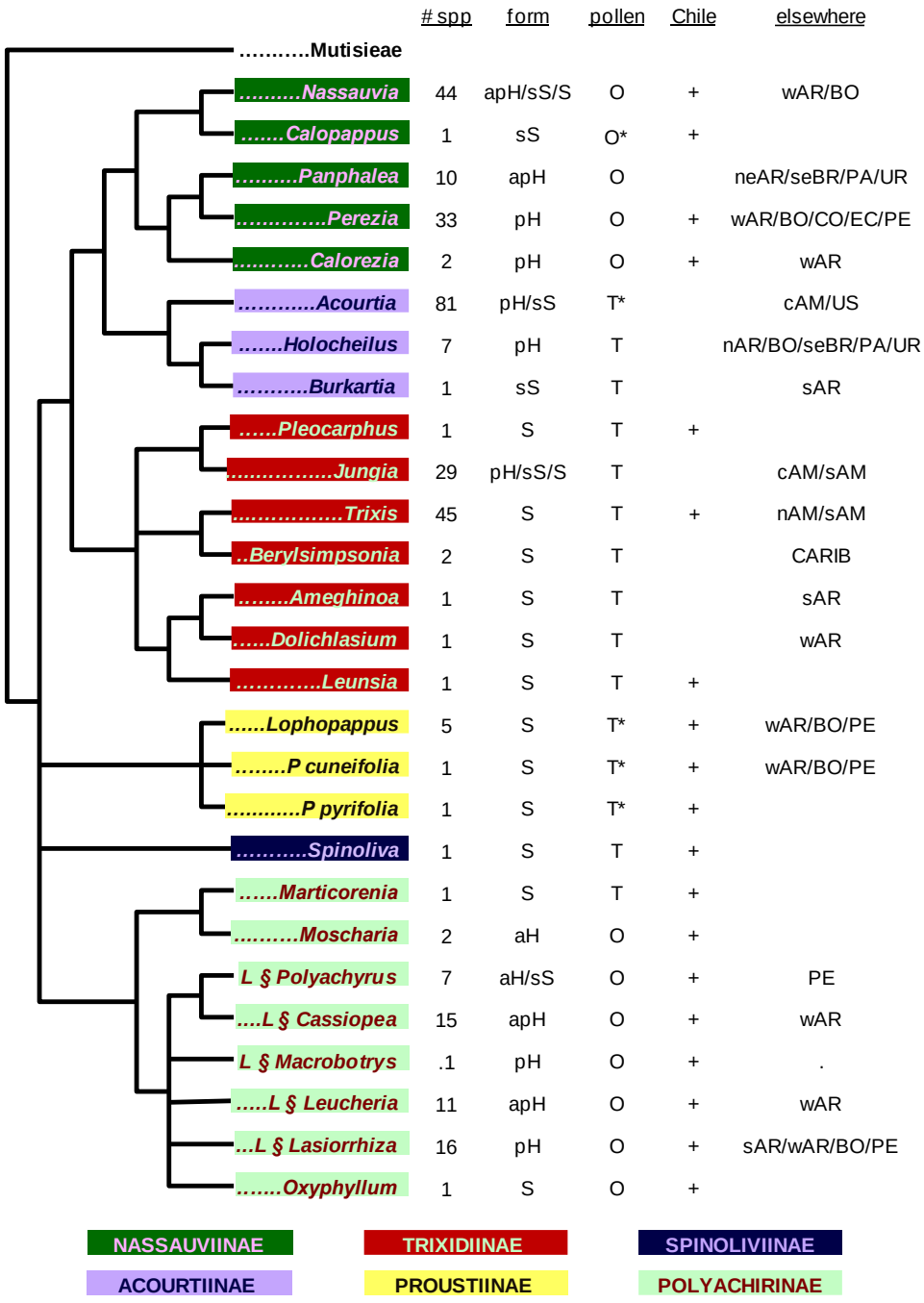

Figure 1 shows the consensus phylogeny of genera of Nassauvieae (after [3, 4]). The taxon labels are color-coded to the subtribe names on the bottom. Data on the right (modified from [2]) indicates the number of species, the growth form (aH = annual herb; pH = perennial herb; sS = subshrub; S = shrub to small tree); the pollen exine type (O = *Oxyphyllum*-type; T = *Trixis*-type; T* = *Proustia*-type (which appears to be variant of the *Trixis*-type); presence of the genus is Chile (+ = yes, - = no); and the distribution of the genera outside of Chile (nAM = North America; cAM = Central America; sAM = South America; nAR = northerm Argentina; neAR = northeastern Argentina; wAR = western Argeninas; sAR = southern Argentina; BO = Bolivia; seBR = southeastern Brasil; CARIB = Carribean Islands; CO = Colombia; EC = Ecuador; PA = Paraguay; PE = Peru; UR = Uruguay; US = United States).

3.2. A phylogenetic sectional taxonomy of Nassauvia and new binomial combinations

A new sectional taxonomy of *Nassauvia* is constructed below, modified (from [7]) to reflect current evidence for phylogenetic relationships as determined by Hershkovitz (submitted ms.; Fig. 2). As demonstrated by earlier studies [8-12], the genus *Triptilion* Ruiz & Pav. is nested within *Nassauvia*. Here, it is submerged therein, as recommended earlier by [8, 10]. However, its species are polyphyletic within *Nassauvia*, so they are classified here in two sections. New combinations of current *Triptilion* species into *Nassauvia* are provided within the classification. The sections listed below are color-coded in the cladogram in Fig. 2. Molecular and morphological data show that none of the polytypic *Nassauvia* sections in [7] is strictly monophyletic, and only ca. half of *Nassauvia* species have been analyzed with molecular data. Nonetheless, it seems quite likely that, with additional evidence and revision, the sections as circumscribed here eventually will accommodate all of the species.

Nassauvia Comm. ex Juss. (Gen. Pl. [Jussieu] 175. 1789). TYPE: *N. magellanica* J.FGmel. [7].

Nassauvia sect. ***Achilleae*** Hershk., *sect. nov*. LECTOTYPE (designated here): *T. achilleae* DC. **Diagnosis**. Annual *Nassauvia* forming a basal leaf rosette, differing from other such Nassauvieae in having external involucral bracts with entire margins and generally shorter than the internal bracts [13]. **New combination:** – ***Nassauvia achilleae*** (DC) Hershk., *comb. nov*. BASIONYM: *Triptilion achilleae* DC (Prodr. [A. P. de Candolle] 7(1): 51. 1838).

Nassauvia sect. ***Caloptilium*** (Lag.) Benth. & Hook.f. (Gen. Pl. [Bentham & Hooker] 2(1): 503.1873 [≡ *Sphaerocephalus* § *Caloptilium* (without rank) D.Don (Philos. Mag. Ann. Chem. 11: 389. 1832]). TYPE *Sphaerocephalus lagascae* D.Don [≡ *N. lagascae* (D.Don) F.Meigen] [cf. 7].

Nassauvia sect. ***Panargyrum*** (Lag.) Weddell (Chlor. Andina 1: 52. 1855). TYPE: *Panargyrum darwinii* Hook. & Arn. [≡ *N. darwinii* (Hook. & Arn.) O.Hoffm. & Dusén] [cf. 7].

Nassauvia sect. ***Mastigophorus*** (Cass.) DC (Prodr. [A. P. de Candolle] 7(1): 50: 1838). TYPE: *Mastigophorus gaudichaudii* Cass. [≡ *N. gaudichaudii* (Cass.) Cass.] [cf. 7].

Nassauvia sect. ***Nassauvia***

Nassauvia sect. ***Strongyloma*** (DC) Hershk., *comb. y stat. nov*. BASIONYM: *Strongyloma* DC (Prodr. [A. P. de Candolle] 7(1): 52. 1838). TYPE: *Triptilion axillare* Lag. [≡ *N. axillaris* (Lag.) D.Don] [cf. 7].

Nassauvia sect. ***Triptilion*** (Ruiz & Pav.) Hershk., *comb. y stat. nov*. BASIONYM: *Triptilion* Ruiz. & Pav. (Fl. Peruv. Prodr. 102, t. 22. 1794). TYPE: *T. spinosum* Ruíz & Pav. [13]. **New combinations:** – ***Nassauvia benaventii*** (J.Rémy) Hershk., *comb. nov*. BASIONYM: *Triptilion benaventii* J.Rémy (Fl. Chile [Gay] 3(3): 357, tab. 39. 1848). – ***Nassauvia berteroi*** (Phil.) Hershk., *comb. nov*. BASIONYM: *Triptilion berteroi* Phil. (Anales Univ. Chile 87: 91. 1894). – ***Nassauvia cordifolia*** (Lag.) Hershk., *comb. nov*. BASIONYM: *Triptilion cordifolium* Lag. (Bot. Reg. 10: t. 853. 1824). – ***Nassauvia gibbosa*** (J.Rémy) Hershk., *comb nov*. BASIOMYM: *Triptilion gibbosum* J.Rémy (Fl. Chile [Gay] 3(3): 356. 1848).

3.3. Recombinations in Philippiamra Kuntze

Teillier & Ibañez [14] recently published a much needed revision of the genus *Philippiamra* Kuntze (Rev. Gen. Pl. 1: 58. 1891.) sensu Hershkovitz [15]. They recognized five taxa in addition to those explicitly or implicitly accepted by [15]. However, they published their taxonomy and new names under the illegitimate generic name *Silvaea* Phil. (Fl. Atacam. 21. 1860.). But Hershkovitz [15] discovered that the name *Silvaea* Phil. is illegitimate, because it is a later homonym of the validly published name *Silvaea* Hook. & Arn. (Bot. Beech. Voy. 211. 1837). I will not recount here the complicated taxonomic history of these generic names, because, in the end, *Silvaea* Phil. remains an illegitimate name, and the later homotypic name *Philippiamra* Kuntze must be used instead. Thus, I recombine here in *Philippiamra* the names of four newly recognized taxa named in *Silvaea* by Teillier & Ibañez [14]. All other names classified in *Silvaea* by [14] already have names available in *Philippiamra*. **New combinations:** – ***Philippiamra barneoudii*** (Phil.) Hershk., *comb. nov*. BASIONYM: *Calandrinia barneoudii* Phil. (Anales Univ. Chile 85: 174. 1893). – ***Philippiamra capitatum*** (Phil.) Hershk., *comb. nov*. BASIONYM: *Silvaea capitata* Phil. (Anales Univ. Chile 85: 321. 1894). – ***Philippiamra celosioides*** var. ***altiplanicum*** (Tellier & S.T.Ibañez) Hershk., *comb nov*. BASIONYM: *Silvaea celosioides* var. *altiplanica* Teillier & S.T.Ibañez (Chlor. Chile. 27(2): 108. 2025). – ***Philippiamra corrigioloides*** (Phil.) Hershk., *comb. nov*. BASIONYM. *Silvaea corrigioloides* Phil. (Fl. Atacam. 22. 1860).

Fig. 2 – Consensus interspecific phylogeny of Nassauvia

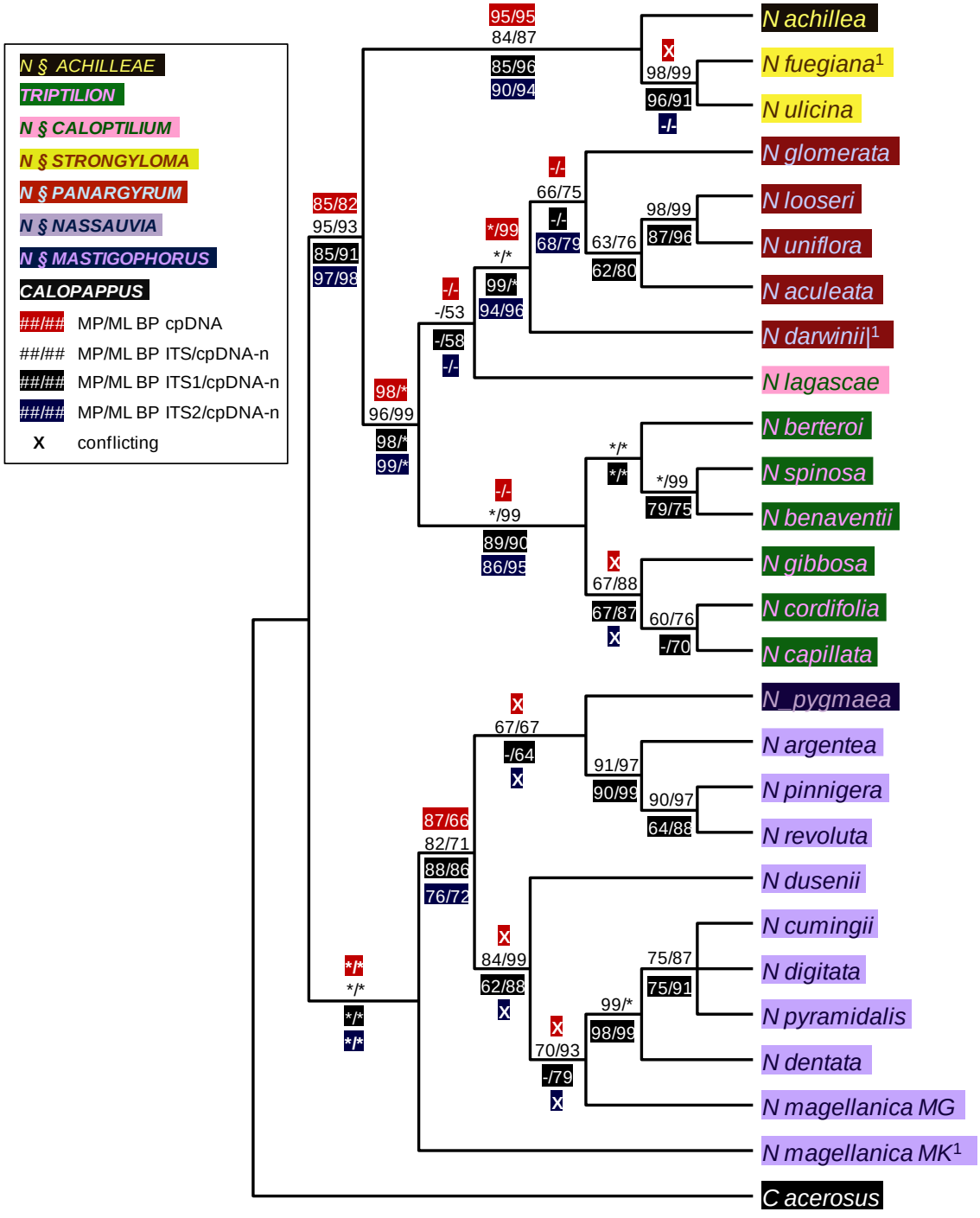

Figure 2 shows the MP/ML bootstrap consensus tree for *Nassauvia* based on combined nuclear rDNA ITS and cpDNA (Hershkovitz, submitted). The MP/ML bootstrap proportions (BPs) for the combined ITS/cpDNA data are indicated above the branch in black text. Below the branch in black-background text are MP/ML BPs for ITS1/cpDNA data, and below this in blue-background text for selected ITS2/cpDNA data. Red-background text show selected cpDNA MP/ML BPs. A small asterisk indicates 100% BP, a hyphen < 50%, and X a branch not present in the corresponding bootstrap consensus. *N pygmaea* currently is misclassified in *N*. sect. *Mastigophorus*. Other data show that the Type species of *N*. *Mastigophorus* (*N. gaudichaudii*) positions elsewhere in the tree.

3.4. A new combination in Cistanthe Spach.

Calandrinia taltalensis I.M.Johnst. is a name currently recognized as a taxonomic synonym of *Cistanthe cachinalensis* (Phil.) Peralta & D.I.Ford [16]. Hershkovitz [17] reported that the taxonomy of this species was "problematic." After further evaluation, I now believe that this Type merits recognition as a distinct species of *Cistanthe* sect. *Cistanthe* sensu Hershkovitz [15]. **New combination:** – ***Cistanthe taltalensis*** (I.M.Johnst) Hershk., *comb. nov.* BASIONYM: *Calandrinia taltalensis* I.M.Johnst. (Contr. Gray Herb. 85: 37. 1929).

4. Conclusions

The purpose of naming and renaming taxa is to provide researchers with a technical term that refers not only as precisely as possible to the organisms that they study, but also a term that locates where those organisms fit in the natural system of all other organisms. That was the principle objective achieved in this work in the classification of Nassauvieae and *Nassauvia* and also in the recognition of *Cistanthe taltalensis* as a species of *Cistanthe* distinct from all other accepted *Cistanthe* species, rather than a species of *Calandrinia*. These changes owe to my taxonomic interpretation of newer taxonomic evidence, as well as my own notions of what an organism "is" and the architecture of the "natural system." These differ among taxonomists and inevitably over time. If another taxonomist disagrees with my interpretations, that is no problem. They may use different names. This is as long as their preferred names also follow the nomenclatural rules. In the wake variable taxonomic opinions and the ever-changing taxonomic landscape, these nomenclatural rules help maintain a degree of order. They specify that whatever taxon name is used, however conceived taxonomically, it must include the Type specimen associated with that name. And they specify that the correct name then must be the oldest valid and legitimate name for that Type specimen. As long as the rules are followed, the meaning of names used by different taxonomists with different opinions and at different times can be, using the rules, "translated." In the present work, I renamed species classified in *Silvaea* Phil. as species of *Philippiamra* Kuntze. This change was not based not on new taxonomic evidence at all. It was necessary because the name *Silvaea* Phil. is not legitimate per the rules. This might seem to be "petty," but it is not. If the rules are not followed, taxonomy descends into the chaos that necessitated the establishment of rules in the first place.

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