

## A phylogenetic sectional taxonomy of *Leucheria* Lag. (Asteraceae; Nassauvieae)

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### Abstract

Multiple molecular phylogenetic analyses have demonstrated that the genus *Polyachyrus* Lag. (8 spp.) is phylogenetically nested among four well-supported but unnamed monophyletic lineages of the genus *Leucheria* Lag. (28-46 spp.; Asteraceae; Nassauvieae). In order to facilitate reference to these lineages per current phylogenetic taxonomic and botanical nomenclatural conventions, a phylogenetic sectional taxonomy is here established. *Leucheria* thus comprises five phylogenetically distinct sections, one of which corresponds to *Polyachyrus*. In addition, an erroneous combination for *Leucheria fusca* is here corrected per nomenclatural convention.

**Keywords:** *Leucheria*; *Polyachyrus*; *Oxyphyllum*; Nassauvieae; Asteraceae

### 1. Introduction

Hershkovitz [1-3] published molecular phylogenetic analyses of species of the Patagonian flowering plant genus *Leucheria* Lag. (28-46 spp.) and related Nassauvieae (Asteraceae). Those analyses demonstrated that the small, distinctive, mostly Chilean genus *Polyachyrus* Lag. (8 spp.) is phylogenetically nested within *Leucheria*. This result was later corroborated by [4]. Both works also corroborated an earlier finding [5] that *Leucheria* otherwise includes four well-supported monophyletic lineages. Hershkovitz [1, 6] submerged the species of *Polyachyrus* into *Leucheria* per current phylogenetic taxonomic convention. Hershkovitz [1] argued that this option was the least disruptive taxonomically. Otherwise, maintaining *Polyachyrus* would require splitting remaining *Leucheria* into four monophyletic genera, which would involve a larger number of new species names. Moreover, two of the monophyletic lineages cannot be distinguished morphologically. But, operationally, the inclusion of *Polyachyrus* in *Leucheria* is awkward, because this lineage is highly distinctive, and also because, for reference, the other four *Leucheria* lineages either have no formal names per ICN botanical nomenclatural rules [7], or they have only older "available" names (per [7]) that have not been used during the past 100+ years. Thus, recent literature [1-5, 8-10] has referred to these lineages only informally/descriptively as, e.g., "*Leucheria* Clade A" or the clade comprising "the acaulescent or subacaulescent species with solitary capitula" [10]. To rectify this, a phylogenetic sectional taxonomy of *Leucheria* is established here, per botanical nomenclatural convention [7], comprising five sections, corresponding to the four monophyletic lineages historically classified in *Leucheria* plus the *Polyachyrus* lineage. A question remaining is the phylogenetic position of the distinctive monotypic Chilean shrub genus *Oxyphyllum* Phil. It is not clear whether this lineage is nested within *Leucheria* or is collateral to it [1, 4]. For now, in the interest of taxonomic stability, it is kept segregated from *Leucheria*. Finally, an earlier published but nomenclaturally erroneous recombination of a *Polyachyrus* species in *Leucheria* [1] is corrected here.

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## 2. Methodology

The monophyletic lineages of *Leucheria* are diagnosed per [1-4], and their formal botanical names are listed/constructed according to the rules and conventions of the ICN [7]. Rules for subgeneric/sectional taxonomy are articulated in Art. 21. However, all of the sectional names established here and the single species name are recombinations of existing names, hence no new names or diagnoses are required. The corresponding rules are articulated in Art. 41.

## 3. Results and discussion

The phylogenetic sectional taxonomy constructed per ICN rules and conventions [7] is as follows:

***Leucheria*** Lag. Amen. Nat. España 1: 32. 1811. TYPE: *L. hieracioides* Cass., Dic. Sci. Nat. (ed. 2) 55: 392. 1828.

### 3.1. *Leucheria* sect. *Leucheria*

Per ICN Art. 21, this autonomous section automatically establishes whenever other sections are recognized, and its Type is the Type of the genus. *Leucheria* sect. *Leucheria* comprises the clade that includes *L. hieracioides*. Jara-Arancio et al. [5] referred to this as *Leucheria* “Clade B, Subclade III.” It includes annuals and herbaceous perennials with branched synflorescences that may be leafy or simply bracteate [4] and capitula with some degree of compartmentalization [11].

***Leucheria* sect. *Cassiopea*** D.Don, Trans. Linn. Soc. London 16(2): 215. 1830. LECTOTYPE (designated here): *L. cinerea* D.Don, Trans. Linn. Soc. London 16(2): 215. 1830. (= *L. senecioides* Hook. & Arn [12, 13]).

This section corresponds to *Leucheria* “Clade B, Subclade II” of [5]. The section includes annuals and herbaceous perennials with leafy branched synflorescences and capitula (with one exception) with some degree of compartmentalization [11]. Don’s [14] circumscription of this section is polyphyletic per [1-4]. Don listed three species: *L. glandulosa* D.Don, *L. pulchella* D.Don, and *L. cinerea* D.Don. All of these were considered by [10] to be synonyms of a single widespread and polymorphic species, *L. tomentosa* (Less.) Crisci (but see [4]). But, phylogenetically, *L. glandulosa* pertains to *L. sect. Leucheria*, whereas plants corresponding to *L. tomentosa* s. str. pertain to *L. sect. Cassiopea*. The species pertinent to *L. sect. Leucheria* base on Types from the Chilean Andean precordillera, whereas those pertinent to *L. sect. Cassiopea* base on Types from the Chilean littoral zone. However, it is not clear the degree to which the distributions of the species in the two sections overlap. Given the provenance of the Type of *L. pulchella*, viz. the littoral zone of northern Chile’s Coquimbo Region, this plant probably pertains to *L. sect. Cassiopea*. However, range overlap of littoral and Andean zone species might be expected here. Because the species of the two sections evidently can be confused, I lectotypified *L. sect. Cassiopea* with *L. cinerea*. The Type is from south-central Chile’s littoral zone near Concepción. It is not likely to be confused with any *L. sect. Leucheria* species, and none of the latter are reported from this zone.

***Leucheria* sect. *Macrobotrys*** DC, Prodr. 7(1): 58. 1838. TYPE: *L. floribunda* DC, Prodr. 7(1): 58. 1838. [*L. floribunda* DC (in Deless., Icon. Sel. Pl. 4: 39, t. 88. 1840) is a later isonym.]

This section is monogeneric per [4; cf. 1, 5]. It corresponds to *Leucheria* “Clade B, Subclade I” of [5], which included also *L. coerulea* J.Rémy. However, the inclusion of the last species in this clade seems to have been based on a misidentified specimen (cf. [4]). The single species is a herbaceous perennial with a leafy, branched synflorescences and uncompartimentalized capitula [11].

***Leucheria* sect. *Lasiorrhiza*** (Lag.) Hershk., *comb. et stat. nov.* BASIONYM: *Lasiorrhiza* Lag., Amen. Nat. España 1: 32. 1811. TYPE: *Perdicium purpurea* Vahl, Skr. Naturhist.-Selsk. 1(2): 9. 1791 [= *Leucheria purpurea* (Vahl) Hook. & Arn. ([10])].

This section corresponds to *Leucheria* “Clade A” in [5]. It includes herbaceous perennial “acaulescent or subacaulescent species with solitary capitula” [10] with uncompartimentalized capitula [11].

***Leucheria* sect. *Polyachyrus*** (Lag.) Hershk., *comb. et stat. nov.* BASIONYM: *Polyachyrus* Lag., Amen. Nat. España 1: 37. 1811. TYPE: *Polyachyrus poeppigii* Kunze ex Less., Linnaea 5(1): 5. 1830. [= *Leucheria poeppigii* (Kunze ex Less.) Hershk., Int. J. Sci. Developm. Res. 9(4): 640. 2024.]

This section corresponds to the conventional classification of *Polyachyrus* as a distinct genus. It includes suffrutescent perennials and one annual with subglobose compartmentalized capitula (“pseudocephalia;” [11]). Phylogenetic evidence suggests that *L. sect. Polyachyrus* is sister to *L. sect. Cassiopea* [1, 4], but this requires additional corroboration. Hershkovitz [1] provided an invalid recombination in *Leucheria* for *Polyachyrus fuscus* (Meyen) Walp. The correct combination is as follows:

*Leucheria fusca* (Meyen) Hershk., comb. nov. BASIONYM: *Diaphoranthus fuscus* Meyen, Reise Erde 1: 406. 1834.

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#### 4. Conclusion

ICN botanical nomenclatural rules [7] in no way specify, oblige, or even encourage classification of taxa according to phylogenetic (or any other) criterion. ICN does not per se regulate taxonomy itself. ICN only establishes nomenclatural rules for valid and legitimate publication and use of taxon names. ICN thus leaves taxonomic criteria to taxonomists themselves. But the phylogenetic taxonomic criterion has become conventional operationally in more recent taxonomic literature and databases. This is because monophyletic taxa are scientifically objective. As phylogenetic evidence accumulates, monophyletic taxa are bound to be more stable taxonomically than taxa based on subjective similarity criteria having no inherent scientific basis. Moreover, they are more informative and meaningful to the broader scientific community, because the name of a monophyletic taxon also corresponds to a scientific fact, viz. a truly historically independent lineage. Often, however, phylogenetic taxonomy disrupts widely accepted existing scientific and popular usage (viz. “language”). This is the case for submersion of the widely accepted and easily recognized genus *Polyachyrus* into another widely accepted and easily recognized genus, *Leucheria* (e.g., [10-13]). But there is no escaping the fact that *Leucheria*, without *Polyachyrus* included, is *not* a truly historically independent lineage. ICN thus provides the rules by which a taxonomist can revise the taxonomy to reflect phylogenetic evidence and, at the same time, minimize the number of taxonomic changes and hence disruption of existing usage. While [1, 6] submerged *Polyachyrus* species into *Leucheria*, the present work established a formal sectional name (per [7]) for this lineage within *Leucheria*. Thus, the traditional taxonomic identity of *Polyachyrus* is not lost, at least not completely. It is lost only at the generic level. But formal recognition of *Polyachyrus* as a section of *Leucheria* in turn automatically established the need for delineation of a *complete* sectional classification of the latter, else all other species classified in *Leucheria* would pertain by default (per [7]) to *Leucheria sect. Leucheria*. And this, like traditional *Leucheria* itself, is not monophyletic. The purpose of submerging *Polyachyrus* into *Leucheria* would be defeated. Thus, the present work formally named four sections of *Leucheria*, each of which is monophyletic per [1-4]. This formally established taxonomy per [7] will allow these names to be used in subsequent research, rather than informal names, like “Clade A,” or descriptive names, like “the clade comprising acaulescent, scapose species.”

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

The author declares no conflict of interest.

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