



## Taxonomic notes on *Plectocephalus* (*Centaurea* s.l., Centaureinae, Asteraceae) from Chile, including new combinations and synonyms

DIEGO PENNECKAMP<sup>1,2</sup>, RODRIGO CHAURA<sup>1,2</sup>, GLORIA ROJAS<sup>2</sup> & TOD STUESSY<sup>3,4</sup>

<sup>1</sup>Laboratorio de Biodiversidad y Ecología del Dosel, Facultad de Ciencias Forestales y Recursos Naturales, Universidad Austral de Chile, P.O. Box 567, Valdivia, Chile

<sup>2</sup>Museo Nacional de Historia Natural, Casilla 787, Santiago, Chile

<sup>3</sup>Department of Botany and Biodiversity Research, University of Vienna, Rennweg 14, A-1030 Vienna, Austria

<sup>4</sup>Herbarium and Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, 1315 Kinnear Avenue, Columbus, USA

\*Authors for correspondence: [diegopfurniel@gmail.com](mailto:diegopfurniel@gmail.com), [rochaura@gmail.com](mailto:rochaura@gmail.com), [gloria.rojas@mnhn.cl](mailto:gloria.rojas@mnhn.cl)

### Abstract

New taxonomic names and combinations are proposed for the genus *Plectocephalus* (Asteraceae) in Chile, which has traditionally been included within *Centaurea* s.l. Based on morphology and geographical distribution, new nomenclatural combinations for seven taxa and eleven new synonyms are given as well as complete descriptions of two species.

**Keywords:** *Centaurea*, *Plectocephalus*, flora of Chile

### Resumen

Se presentan nuevas combinaciones nomenclaturales para el género *Plectocephalus* D. Don (Asteraceae) en Chile, tradicionalmente considerado como *Centaurea* L. s.l. Se realizan nuevas combinaciones de nombres para siete taxas y se proponen once nuevos sinónimos, basados en caracteres morfológicos junto a la revalidación de dos especies, considerando aspectos morfológicos y de distribución geográfica, de las cuales se entrega una descripción completa.

**Palabras clave:** *Centaurea*, *Plectocephalus*, flora de Chile

### Introduction

Asteraceae are the largest family of flowering plants with more than 23,000 species distributed over all continents except Antarctica (Funk *et al.* 2005). Tribe Cardueae is especially abundant with 73 genera and approximately 2,400 species (Susanna & Garcia-Jacas 2007), which are mainly diversified in Eurasia and Northern Africa (Moreira-Muñoz 2006, Barres *et al.* 2013). Phylogenetically, Cardueae are placed between Mutisieae-Gochnatieae and Cichorieae (Funk *et al.* 2005, 2009), suggesting that Cardueae may have had their ancestry in the African tribes of Carduoideae (Ortiz *et al.* 2009). The systematic classification of Cardueae has changed through time (i.e., Hoffmann 1894; Dittrich 1977; Bremer 1994), with the most recent classification for the tribe having been proposed by Susanna & Garcia-Jacas (2007).

An important genus within Cardueae is *Centaurea* (s.l.) of subtribe Centaureinae, which contains 32 genera (Funk *et al.* 2009). *Centaurea* represents a broad group that was initially described by Linnaeus (1753: 909) as an artificial assemblage of several species with distinct morphological and biogeographical aspects of such magnitude that might have suggested generic differentiation (Susanna *et al.* 2011). Recently, the generic limits of *Centaurea* have been redefined and clarified based on morphological and molecular phylogenetic studies (Susanna & Garcia-Jacas 2007; Susanna *et al.* 2011; Gutiérrez *et al.* 2014).

Historically Don (1830: sub t. 51) segregated the genus *Plectocephalus* from *Centaurea* based on the distinguishing characteristics of phyllaries with fimbriate appendages at the apex, florets with staminodes, and a deciduous pappus.

Later, Candolle (1837: 575) considered *Plectocephalus* as a section of *Centaurea*, a perspective largely followed in subsequent systematic treatments and floras. More recently several authors, based on morphological and molecular data, have again recognized *Plectocephalus* as distinct from *Centaurea s. str.* (Lyaruu 1991; Hind 1996; Keil 2006; Susanna & Garcia-Jacas 2007; Zuloaga *et al.* 2008; Susanna *et al.* 2011; Gutiérrez *et al.* 2014).

*Plectocephalus* has a scattered subcosmopolitan distribution, with species occurring in North America, Africa, and southern South America with geographic disjunctions and discontinuous distributions. Its origin might have been in the Irano-Turkish region from where it could have dispersed and evolved during the last approximately six million years (Susanna *et al.* 2011). There is one endemic species in the Ethiopian highlands: *P. varians* (A.Rich.) C. Jeffrey ex Cuf. (Jeffrey 1968; Lyaruu 1991); two species in North America: *P. americanus* (Nutt.) D. Don and *P. rothrockii* (Greenm.) D.J.N. Hind, the former in the southern U.S.A. and the latter in northern Mexico (Keil 2006); and one species in Argentina and Uruguay in the basin of the Río Plata: *P. tweediei* (Hook. & Arn.) N. Garcia & Susanna (Gutiérrez *et al.* 2014).

In Chile there are approximately ten species of *Plectocephalus*, the major diversity of *Plectocephalus* worldwide, which are distributed and diversified in the central-north area, especially in Mediterranean-zone vegetation. The Chilean Mediterranean floristic area is recognized as a biodiversity hotspot (Myers *et al.* 2000) with a high biodiversity conservation value.

Species of *Plectocephalus* occur from north in the coastal range and high mountains of the Atacama Desert (24°56' S, 70°28' W) to south in the Nahuelbuta mountain range (37°31' S, 72°48' W). A map of the distribution of the genus in Chile is provided based on SGO herbarium specimens (Figure 1). The high diversification of *Plectocephalus* species in central Chile suggests that *Plectocephalus* may have migrated there before the uplift of the Andes and adaptively diversified in conjunction with climatic and orographic changes resulting from formation of the Arid Diagonal (Susanna *et al.* 2011). An additional group in Chile, presumably more recently derived from continental *Plectocephalus*, are the oceanic island ne endemic genera *Centaurodendron* Johow (1896: 63) and *Yunquea* Skottsberg (1929: 163), both restricted to Robinson Crusoe Island of the Juan Fernández Archipelago (Susanna & Garcia-Jacas 2007; Susanna *et al.* 2011; Stuessy *et al.* 2017a).

The purpose of this paper is to examine the morphology of species of *Plectocephalus* within the continental and island Chilean floras, and to clarify generic limits with regard to *Centaurea*, *Centaurodendron*, and *Yunquea*.

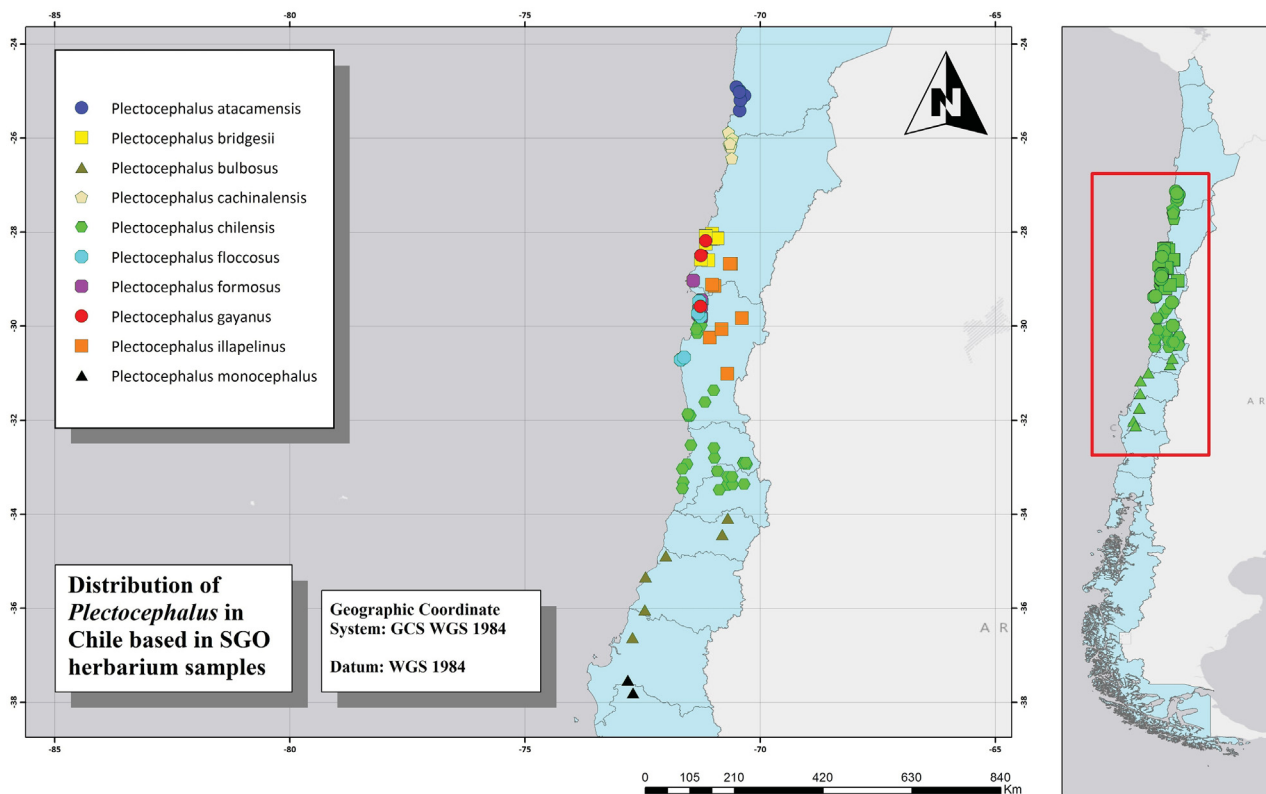


FIGURE 1. Distribution map of *Plectocephalus* in Chile.

## Methodology

The present taxonomic revision of species of *Centaurea s.l.* native to Chile was based on herbarium specimens from the National Museum of Natural History, Santiago de Chile (SGO; Thiers 2019). New combinations and synonyms resulting from applications of concepts of *Plectocephalus* and *Centaurea s. str.* within Chile followed the *International code of nomenclature for algae, fungi and plants* (Turland *et al.* 2018). All types were examined de visu at SGO, from digital scans at JSTOR Global plants (<http://plants.jstor.org>) or herbarium websites of BM, E, FI, K and P.

## Results

Ten species and one variety of *Plectocephalus* are recognized for Chile, all endemic, and these have previously been treated as belonging to *Centaurea*: *C. atacamensis* (Reiche) I.M. Johnst.; *C. bridgesii* S. Moore; *C. bulbosa* Hook. & Arn.; *C. cachinalensis* Phil.; *C. chilensis* Bertero ex Hook. & Arn.; *C. chilensis* Bertero ex Hook. & Arn. var. *breviloba* DC; *C. floccosa* Hook. & Arn.; *C. formosa* Ravenna; *C. gayana* J. Rémy; *C. illapelina* Phil.; and *C. monocephala* J. Rémy.

*Centaurea s. str.* does not occur natively in Chile, but there are some invasive species such as: *C. benedicta* (L.) L., *C. calcitrapa* L., *C. cyanus*, L. *C. jacea* L., *C. melitensis* L., *C. nigra* L., and *C. solstitialis* L. (Matthei 1995; Rodríguez *et al.* 2018) as well as garden species.

## Discussion

In previous investigations, only three species of *Centaurea* have been treated under *Plectocephalus*.

Loudon (1829: 1446) moved *C. chilensis* into *Plectocephalus* as *P. chilensis* D. Don ex Loudon, and N. Garcia & Susanna (in Susanna *et al.* 2011: 277), based on morphological and molecular data, transferred *C. cachinalensis* and *C. floccosa* into *Plectocephalus* as *P. cachinalensis* (Phil.) N. Garcia & Susanna and *P. floccosus* (Hook. & Arn.) N. Garcia & Susanna.

Of all the species of *Plectocephalus* in Chile, *P. chilensis* is the most variable morphologically. This species appears to be highly influenced by the environment, and hence infraspecific taxa previously have been recognized. Zuloaga *et al.* (2008) and Rodríguez *et al.* (2018) have recognized two varieties within *Centaurea chilensis*: var. *breviloba* DC. and var. *stenolepis* Phil. Variety *breviloba* was described by Candolle (1837: 575) for a variant along the coast between Valparaíso (c. 33° S, 71° W) and Coquimbo (c. 30° S, 71° W), based on few collections, differentiated by the smaller capitula and smaller leaves with shorter lobules (Reiche 1905). Variety *stenolepis* was described by Philippi (1895: 42) as a distinct taxon, and it is quite different morphologically, but we here treat it as a synonym of *Plectocephalus bridgesii*.

Particularly interesting are relationships of *Plectocephalus* with the genera *Centaurodendron* and *Yunquea*, endemic to the Juan Fernández Archipelago. *Centaurodendron* (with the species *C. dracaenoides*) was described by Johow (1896) as a distinct genus but related to *Centaurea*. Skottsberg (1957: 587) later added another species to the genus, *C. palmiforme*. The endemic genus, *Yunquea*, containing the single species *Y. tenzii*, was also described by Skottsberg (1929: 163). He pointed out the strong similarity of *Yunquea* to *Centaurodendron*, being separated by narrow morphological and leaf anatomical differences (Skottsberg 1957; Carlquist 1958), and also a general affinity to *Centaurea* of other regions.

*Centaurodendron* has been proposed by Dittrich (1977), Hellwig (2004), and Susanna *et al.* (2011) to belong in *Plectocephalus*. But based on morphological differences of the inflorescence and growth habit, together with their natural history (Susanna *et al.* 2011), we follow Urbina-Casanova *et al.* (2015), Stuessy *et al.* (2017a), Rodríguez *et al.* (2018), and Penneckamp (2018a) in treating *Centaurodendron* as generically distinct. The taxonomic status of *Yunquea* is more difficult to resolve due largely to lack of suitable herbarium material with good reproductive structures. No molecular analyses have yet been done. Recognition of *Yunquea* is accepted by some authors (Stuessy *et al.* 2017b), who argue that because so much information is lacking, it is wise at this time to leave *Yunquea* as distinct from *Centaurodendron*. *Yunquea* clearly resides, however, within the *Centaurodendron-Plectocephalus* group. As for evolutionary origins, it is highly likely that *Centaurodendron* was derived from a progenitor within continental

*Plectocephalus* (Susanna & Garcia-Jacas 2007; Susanna *et al.* 2011) followed by speciation on the Robinson Crusoe Island. *Yunquea* may have evolved from this same lineage (Stuessy *et al.* 2017b), or perhaps from a separate introduction (Penneckamp 2018b).

## Taxonomic Treatment

### *Plectocephalus atacamensis* (Reiche) Penneck. & Chaura, *comb. et stat. nov.*

Basionym:—*Centaurea floccosa* Hook. & Arn. var. *atacamensis* Reiche (1904: 468). *Centaurea atacamensis* (Reiche) Johnston (1929: 130). Type:—CHILE: Antofagasta Region, Antofagasta Province, Taltal, Puerto Oliva, October 1887, *Boerchers s.n.* (Holotype SGO 000005195!).

### *Plectocephalus bridgesii* (S. Moore) Penneck. & Chaura, *comb. nov.*

Basionym:—*Centaurea bridgesii* Moore (1899: 169). Type:—CHILE: Coquimbo Region, *T. Bridges 1397* (Holotype BM 000947850!). = *Centaurea chilensis* Bertero ex Hook. & Arn. var. *stenolepis* Philippi (1895: 42). Type:—CHILE: Atacama Region, Huasco Province, Carrizal Bajo [“Habitat ad Copiapo, in valle Carrizal, prope Guanta etc.”], 1871, *T. King s.n.* (Holotype: SGO 000005193!; isotype SGO 000006781!).

Note:—The labels of the types of *C. bridgesii* do not carry any information on the date of collection or specific locality, only a nonspecific place in Coquimbo Province. This area is the extreme southern distribution of the species; only one other specimen from the same province is known (SGO 75731!).

### *Plectocephalus bulbosus* (Hook & Arn.) Penneck. & Chaura, *comb. nov.*

Basionym:—*Centaurea bulbosa* Hook. & Arn. in Hooker (1835: 111). Type:—CHILE: Valparaíso Region, Valparaíso Province, Plasilla near Valparaíso, 1831, *H. Cuming 396* (Lectotype **designated here**: K 000527776!; isolectotypes E 00394714!, E 00394716!, FI 004938!, K 000527777!, P 00703647!). Other syntype:—CHILE: Valparaíso Region, Valparaíso Province, La Plasilla near Valparaíso, probably 1829–1840 (Lanjouw & Stafleu 1954), *T. Bridges 119* (E 00394715!). = *Centaurea dianthoides* J. Rémy in Gay (1849: 312). Type:—CHILE: “se cría en la República,” 1839, *C. Gay 187* (Lectotype **designated here**: P 00703640!; isolectotype SGO 000005194!).

Note:—The specimen labels do not provide information on the date of collection or specific locality.

### *Plectocephalus chilensis* (Bertero ex Hook. & Arn.) G. Don ex Loudon var. *brevilobus* (DC) Penneck. & Chaura, *comb. nov.* (Figure 2).

Basionym:—*Centaurea chilensis* Bertero ex Hook. & Arn. var. *breviloba* Candolle (1837: 575). Type:—CHILE: Coquimbo Region, Coquimbo Province, Coquimbo, 1831/1833, *C. Gaudichaud 94* (Lectotype **designated here**: P 00703636!; isolectotypes: FI 004939!, P 00703637!).

Note:—This variety is differentiated by smaller leaves with shorter lobules (Reiche 1905), also the capitulum is sessile, without peduncle, and the flowering branches are densely leaved, whereas in *P. chilensis* the capitulum is pedunculate. This plant has more woody habit rather than *P. chilensis* s.str. We recognize this variety, following Rodríguez *et al.* (2018).

### *Plectocephalus formosus* (Ravenna) Penneck. & Gl. Rojas, *comb. nov.* (Figure 3).

Basionym:—*Centaurea formosa* Ravenna (2006: 48–49). Type:—CHILE: Coquimbo Region, Elqui Province, bushy field near El Arrayán about 25 km north from La Serena, October 2003, *P. Ravenna 5023* (Holotype BA; isotypes Herb. Rav., CONC). Neotype:—CHILE. Coquimbo Region: Elqui Province, Panamericana Norte, between La Serena and Caleta Hornos, before Juan Soldado bridge, (29°39' S, 71°18' W), 80–190 m, 3 October 1991, *Ch. von Bohlen 1209* (holotype SGO 133272!).

Note:—Although our efforts to locate the type material in the mentioned institutions have been unfruitful, we accept this as a distinct species based on the detailed description. However the type material do not exist at the herbaria cited (BA, CONC, pers. comm.) and the P. Ravenna's personal herbarium was destroyed (Ravenna's daughter, pers. comm.), so here we designate a new type specimen for this species name.

Shrub ca. 1.5–2 m tall, branched, lignified at base, perennial. Stems glabrous to glabrescent, striated toward apex. Leaves pinnately-parted to pinnatisect, (2–)2.5–9 × 0.7–2.6 cm, lamina glabrous to glabrescent at adaxial surface and puberulent at abaxial surface with revolute margin. Capitulum borne singly on a glabrescent, striate peduncle, accompanied by some reduced leaves in form of pinnatifid bracts. Involucre globose, hemispheric-campanulate, large, (2–)2.5–3.5(–4) cm diam., woolly-pilose at base. Phyllaries many in 5–7 series. Internal phyllaries of first series sparsely woolly-pilose on adaxial surface at the base and center, becoming glabrous toward margins or rarely glabrescent. External series phyllaries shorter and wider, subcordate, ovate to ovate-lanceolate with acute apex, 5–10 × 5–7 mm, inner phyllaries longer and narrowly lanceolate, linear-lanceolate to subspathulate, 25 × 2–5 mm, with apex expanded into an erect spreading pectinate-fringed coriaceous appendage, brownish, being c. 1/3 to equaling inner phyllary length or even external phyllary length. Phyllaries with fimbriate appendage with a long mucro at apex. Ray florets sterile, 3.5–5 × 0.4–0.5 cm, corolla 5-lobed, lobes lanceolate with apex acute, 2.5 × 0.3–0.4 cm, tube 1.5–2.5 cm long. Disc florets tubular, smaller than ray florets, fertile and hermaphroditic, 2–2.3 × 0.2–0.3 cm, corolla 5-lobed, lobes acute to linear-lanceolate separated at least 1/5 to 1/4 of length. Corollas very showy, ligules pink to whitish, disc floret corollas whitish-yellow. Style 8–10 mm with bilobed stigma, stigma branches ca. 3 mm. Anthers ca. 7 mm long. Pappus and mature cypsela not seen.



FIGURE 2. *Plectocephalus chilensis* var. *brevilobus*: A, living plant in natural habitat; B, detail of flowering capitulum. Photograph by Rodrigo Chaura.

**Etymology:**—From the Latin, *formosus*, meaning beautiful, because this species has large and very showy ornamental flowers, having one of the largest capitula in the genus.

**Distribution and ecology:**—Restricted to sclerophyllous shrublands in coastal areas of Juan Soldado north of La Serena, Coquimbo Region (ca. 29°39'31.00" S, 71°18'42.00" W) and in the range of Chañaral de Aceituno (ca. 29°3'60.00" S, 71°29'0.00" W) in the Atacama Region.

**Notes:**—This species was proposed by Ravenna (2006) in a little-known journal, but nonetheless effectively published. The name was also validly published because the author provided a description, type specimen, and indicated the institution of deposit. Since the species appears to be a good one, and for clarity with regard to the other species of *Plectocephalus* in Chile, we provide a new comprehensive description and key.

*Plectocephalus formosus* resembles *P. floccosus*, which differs by lacking woolly-tomentose stems. *Plectocephalus formosus* is also similar to *P. chilensis*, from which the former differs in the abaxial puberulent surface of the leaves. One might speculate that based on intermediate morphological features and distribution, *P. formosus* might have

originated through hybridization between *P. chilensis* and *P. floccosus*. This might be an example of a recent speciation radiation that occurred in this region of the distribution of *Plectocephalus* (A. Susanna, pers. comm.).



FIGURE 3. *Plectocephalus formosus*: A, type specimen; B, living plant in natural habitat, photograph by Gloria Rojas.

**Specimens examined:**—CHILE. **Atacama Region:** Huasco Province: Chañar de Aceitunas, 60 km al W. de Domeyko (29°7' S, 71°25' W), 300–500 m, 8 Sep 1949, *W. Biese 2544* (SGO 104196). **Coquimbo Region:** Elqui Province: Juan Soldado (29°48' S, 71°15' W), 100 m, 12 Oct 1965, *C. Muñoz 48* (SGO 135306); Quebrada de Juan Soldado, al N de La Serena, por la carretera panamericana (29°48' S, 71°15' W), 110 m, 17 Sep 1957, *C. Muñoz 4296* (SGO 118488); La Serena, 30 km N (29°37' S, 71°17' W), 30 m, 25 Dec 1971, *K. Beckett, M. Cheese & J. Watson 4678* (SGO 110041); Km 490, hacia los roqueros (29°45' S, 71°19' W), 200 m, 21 Oct 1984, *M. Muñoz 1914* (SGO 108070); El Tofo (29°27' S, 71°15' W), 300 m, 15 Oct 2006, *N. Schulz 9ET* (SGO 154742).

*Plectocephalus gayanus* (J. Rémy) Penneck. & Chaura, *comb. nov.*

Basionym:—*Centaurea gayana* J. Rémy in Gay (1849: 310). Type:—CHILE: Coquimbo Region, “cerros de la provincia de Coquimbo”, 1839, *C. Gay 1005* (Holotype P 00703638!; isotype SGO 65358!).

= *Centaurea huascoënsis* Ravenna (2006: 49–50). Type:—CHILE: Atacama Region, Huasco Province, Nov 2001, *P. Ravenna 4893* (Holotype BA).

Note:—The assessment of this species is based on the description, as our efforts to obtain its type material have been unsuccessful.

*Plectocephalus illapelinus* (Phil.) Penneck. & Gl. Rojas, *comb. nov.* (Figure 4).

Basionym:—*Centaurea illapelina* Philippi (1895: 43). Type:—CHILE: Coquimbo Region, Elqui Province, El Peñon, *R.A. Philippi s.n.* (Holotype SGO 000005197!; isotype SGO 000005196!).

Shrub ca. 0.6–0.8 m, perennial, branched, lignified at base, green-gray. Stems densely puberulent-tomentose, woolly-white at the base and glabrescent toward apex. Leaves narrowly pinnatifid to pectinate-pinnatifid, deeply divided, sessile, tomentose and glaucous, (1.5–)2.5–6.5(–12.5) × 1–2.5 cm, with 4–6 pairs of linear segment pairs opposite or

slightly subopposite, (0.3–)0.5–1.6(–2) × 0.1–0.2(–0.3) cm, margin of segments entire or sometimes toothed, at apex acute, submucronate, or mucronate. Upper leaves of floral stem smaller and irregular, peduncle striated, glabrescent, with few leafy bracts, heads borne singly. Involucre hemispheric, subcampanulate, 2–3 cm diam. Phyllaries many in 5–6 series, lanceolate to narrowly lanceolate, acute, glabrescent on adaxial surface except at margin and sometimes basal phyllaries minutely pubescent. External phyllaries shorter and broad, 5–7 × 2–3 mm, inner phyllaries longer and narrower, 15–25 × 2–4 mm, with apex expanded into an erect spreading pectinate-fringed coriaceous appendage 1/4–1/3 of total phyllary length. Most inner phyllaries notably narrower and longer, linear-lanceolate. Ray flowers sterile, 3 × 0.3–0.4 cm, corolla 5-lobed, lobes lanceolate to narrowly lanceolate with acute apex, 1.2 × 0.3 cm, tube of (1–)1.5–1.8 cm long. Disc florets tubular, smaller than ray florets, fertile and hermaphroditic, 1.6–2.1 × 0.2 cm, corolla 5-lobed, lobes acute, separated c. 1/3 of total corolla length. Corolla white to pale pink. Style with bifid stigma, 1–2 mm longer than anthers. Anthers ca. 8 mm long. Ovary ca. 3 mm long. Mature cypselae not seen.

**Etymology:**—From the type locality around Illapel, Coquimbo Region, northern Chile.

**Distribution and ecology:**—Plant from xerophytic shrubland communities, not along the coast.

**Notes:**—This species was synonymized by Reiche (1905) under *Centaurea floccosa*, but *Plectocephalus illapelinus* is different from *P. floccosus* by having a smaller capitulum and deeply pinnatifid leaves with narrow linear segments. This species is also similar to *P. bridgesii*, but the former is distinguished by its puberulo-tomentose stems and phyllaries without dark-colored appendages in contrast to glabrous stems and phyllaries with dark-colored appendages in the latter. As for the distribution, *P. illapelinus* does not grow along the coast, whereas *P. floccosus* and *P. bridgesii* are typical in the coastal vegetation.

**Specimens examined:**—CHILE. **Atacama Region:** Huasco Province: Embalse Santa Juana, nuevo mirador (28°40' S, 70°38' W), 670 m, 16 Oct 2010, *A. Moreira 1312* (SGO 160832); Embalse Santa Juana, mirador, km. 670 (28°40'27" S, 70°36'41" W), 800 m, 12 Nov 2004, *Fundación Philippi 92* (SGO 167510); Cuesta Pajonales, en cima, lado sur (29°9' S, 70°58' W), 1200 m, 27 Oct 1984, *M. Muñoz 2015* (SGO 108071); Vallenar, Cuesta de Pajonales (29°07' S, 71°01' W), 1200 m, 10 Oct 1987, *S. Teillier 1027* (SGO 141718). **Coquimbo Region:** Elqui Province: Andacollo (30°15' S, 71°4' W), 800–1000 m, 24 Oct 1991, *A. Brinck s.n.* (SGO 122806); Quebrada San Carlos, c. 5 km al Oeste de Vicuña, a los pies del Cerro Tololo, Valle del Río Elqui (30°4' S, 70°49' W), 600–800 m, 11 Nov 1974, *C. Villagrán, R. Torres & R. Osorio s.n.* (SGO 126616).

***Plectocephalus monocephalus* (J. Rémy) Penneck. & Chaura, *comb. nov.***

Basionym:—*Centaurea monocephala* J. Rémy in Gay (1849: 311–312). Type:—CHILE: Biobio Region, Nahuelbuta, “cerros de Nahuelbuta, cerca de Nacimiento”, *C. Gay 193* (Holotype P 00703667!; isotypes P 00703668!, SGO 000005198!).

Note:—The labels of the types of *Centaurea monocephala* provide no information on the date of collection or any specific locality; the isotype at SGO says “Prov. Concepción, Cordillera Nahuelbuta prope Puren”.

**Notes:**—This species has not been collected again since the original description, and because the original habitat has been deeply modified in the last century, we suspect that *P. monocephalus* may be extinct.

**Key to the species of *Plectocephalus* in Chile**

1. Plants unbranched with a terminal, solitary, sessile capitulum ..... *Plectocephalus monocephalus*
1. Plants branched with several capitula.....2
2. Plants rhizomatous; flowering stems with linear entire leaves ..... *Plectocephalus bulbosus*
2. Plants not rhizomatous; flowering stems with divided leaves.....3
3. Stems tomentose to woolly-pubescent .....4
3. Stems glabrous or glabrescent.....7
4. Leaves crenulate-dentate; corollas yellow or yellow-pink ..... *Plectocephalus gayanus*
4. Leaves divided, pinnatifid; corollas whitish or pink .....5
5. Phyllaries with appendage colorless at the center, glabrous or glabrescent; leaves deeply pinnatisect with narrow linear segments ..... *Plectocephalus illapelinus*
5. Phyllaries fimbriate, with appendage black or blackish at the center, pubescent; leaves pinnate or pinnatifid with acute lanceolate segments .....6
6. Capitulum 2 cm or less in diameter; phyllaries in 4–5 series; flowering stems with many leaves below the capitula..... *Plectocephalus atacamensis*
6. Capitulum more than 2 cm in diameter; phyllaries in 6–7 series; flowering stems with few leafy bracts or reduced leaves below the capitula ..... *Plectocephalus floccosus*
7. Capitulum borne sessile in the flowering branch ..... *Plectocephalus chilensis* var. *brevilobus*

- 7. Capitulum borne in a pedunculate flowering branch .....8
- 8. Leaves deeply pinnatisect with narrow linear segments .....*Plectocephalus bridgesii*
- 8. Leaves pinnate or pinnatifid with acute lanceolate segments .....8
- 9. Adult leaves 1.5–2.5 cm long; capitulum 1–1.5 cm in diameter ..... *Plectocephalus cachinalensis*
- 9. Adult leaves more than 5 cm long; capitulum 2–4 cm in diameter.....9
- 10. Leaves glabrous on abaxial surface..... *Plectocephalus chilensis*
- 10. Leaves puberulent on abaxial surface.....*Plectocephalus formosus*



FIGURE 4. *Plectocephalus illapelinus* (SGO 108071).



## Acknowledgments

We appreciate: comments and early reviews of this text by Alfonso Susanna, Núria García Jacas, and Diego Gutiérrez; comments about the distribution of *Plectocephalus* and *Centaurea* in Chile by Arón Cádiz and Patricio Novoa; comments of editor Alexander Sennikov; construction of the map by Marcelo Lagos; and help with the early English text from Gonzalo Díaz.

## References

- Barres, L., Sanmartín, I., Anderson, C., Susanna, A., Buerki, S., Galbany-Casals, M. & Vilatersana, R. (2013) Reconstructing the evolution and biogeographic history of tribe Cardueae (Compositae). *American Journal of Botany* 100 (5): 867–882.
- Candolle, A.P. de (1837) *Prodromus Systematis Naturalis Regni Vegetabilis*, vol. 6. Treuttel & Würtz, Paris.
- Carlquist, S. (1958) Anatomy and systematic position of *Centaurodendron* and *Yunquea* (Compositae). *Brittonia* 10: 78–93.  
<https://doi.org/10.2307/2804919>
- Dittrich, M. (1977) Cynareae – systematic review. In: Heywood, V.H., Harborne, J.B. & Turner, B.L. (Eds.) *The biology and chemistry of the Compositae*, vol. 2. Academic Press, London, pp. 999–1015.
- Don, D. (1830) *Plectocephalus americanus*. In: Sweet, R. *The British Flower Garden* 4: pl. 51.
- Funk, V.A., Bayer, R.J., Keeley, S., Chan, R., Watson, L., Gemeinholzer, B., Schilling, E., Panero, J.L., Baldwin, B.G., Garcia-Jacas, N., Susanna, A. & Jansen, R.K. (2005) Everywhere but Antarctica: Using a supertree to understand the diversity and distribution of the Compositae. *Biologiske Skrifter* 55: 343–374.
- Gay, C. (Ed.) (1849) *Historia física y política de Chile segun documentos adquiridos en esta republica durante doce años de residencia en ella y publicada bajo los auspicios del supremo gobierno. Botánica, Tomo cuarto. Flora Chilena*. Museo de historia natural de Santiago y en casa del autor, imprenta E. Thunot y Ca., Paris, 516 pp.
- Gutiérrez, D.G., Garcia-Jacas, N. & Susanna, A. (2014) *Plectocephalus* D.Don. In: Zuloaga, F.O., Rugolo, Z.E. & Anton, A.M. (Eds.) *Flora Argentina*, vol. 7 (1). Instituto Multidisciplinario de Biología Vegetal (CONICET-UNC), Argentina, pp. 293–294.
- Hellwig, F.H. (2004) Centaureinae (Asteraceae) in the Mediterranean – history of ecogeographical radiation. *Plant Systematics and Evolution* 246: 137–162.
- Hind, N. (1996) *Plectocephalus rothrockii*. Compositae. *The Kew Magazine: Incorporating Curtis's Botanical Magazine* 13 (1): 3–7.  
<https://doi.org/10.1111/j.1467-8748.1996.tb00528.x>
- Hoffmann, O. (1894) Compositae. In: Engler, A. & Prantl, K. (Eds.) *Die natürlichen Pflanzenfamilien*, Teil IV.5. Verlag von Wilhelm Engelmann, Leipzig, pp 87–392.
- Hooker, W.J. & Arnott, G. (1830–1841) *The Botany of Captain Beechey's Voyage*. Henry G. Bohn, London & Edward Khull, Glasgow, 485 pp.
- Hooker, W.J. (1835) *Companion to the Botanical magazine: being a journal, containing such interesting botanical information as does not come within the prescribed limits of the magazine; with occasional figures*, vol. 1. E. Conchman, London, pp. 1–384.
- Jeffrey, C. (1968) The Cynareae in east tropical Africa. *Kew Bulletin* 22 (1): 101–104.  
<https://doi.org/10.2307/4107829>
- Johnston, I.M. (1929) Papers on the flora of Northern Chile. *Contributions from the Gray Herbarium of Harvard University* 85: 1–172.
- Johow, F. (1896) *Estudios de la flora de las islas de Juan Fernández*. Gobierno de Chile, Imprenta Cervantes, Santiago de Chile, 310 pp.  
<https://doi.org/10.5962/bhl.title.95341>
- Keil, D.J. (2006) *Plectocephalus*. In: Flora of North America Editorial Committee (Eds), *Flora of North America North of Mexico*, vol. 19, 20 and 21 (Asteridae) online. New York and Oxford. Available from: [http://www.efloras.org/florataxon.aspx?flora\\_id=1&taxon\\_id=125862](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=125862) (accessed: 12 April 2019)
- Lanjouw, J. & Stafleu, F.A. (1954) *Index Herbariorum*, part II. Collectors, A–D. *Regnum Vegetabile* 2: 1–174.
- Linneo, C. (1753) *Species Plantarum*, vol. 2. L. Salvius, Stockholm, Sweden, 561–1200 pp.
- Loudon, J.C. (Ed.) (1840) *Loudon's encyclopaedia of plants; comprising the specific character, description, culture, history, application in the arts, and every other desirable particular respecting all the plants indigenous to, cultivated in, or introduced into Britain*. Longman, Orme, Brown, Green & Longmans, London, 1329 pp.  
<https://doi.org/10.5962/bhl.title.96249>
- Lyaruu, H.V.M. (1991) *A Revision of the Genus Plectocephalus in Ethiopia*. Thesis for the Degree of Master of Science in Biology. The School of Graduate Studies, Addis Ababa University. Etiópia, 103 pp.
- Matthei, O. (1995) *Manual de las malezas que crecen en Chile*. Alfabeta Impresores, Santiago. 545 pp.

- Moore, S. (1899) *Alabastra diversa* part. IV. *Journal of Botany, British and Foreign* 37: 168–175.
- Moreira-Muñoz, A. (2006) Posición filogenética y distribución de los géneros de Compuestas chilenas, con algunas notas biogeográficas. *Revista Chagual* 4: 12–28.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., Da Fonseca, G.A. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403 (6772): 853–858.  
<https://doi.org/10.1038/35002501>
- Ortiz, S., Bonifacino, M., Crisci, J., Funk, V., Hansen, H., Hind, D., Katinas, L., Roque, N., Sancho, G., Susanna, A. & Tellería, M.C. (2009) Chapter 12. The basal grade of Compositae: Mutisieae (sensu Cabrera) and Carduoideae. In: Funk, V., Susanna, A., Stuessy, T. & Bayer, R. (Eds.) *Systematics, Evolution, and Biogeography of Compositae*. International Association for Plant Taxonomy, Vienna, Austria, pp. 193–213.
- Penneckamp, D. (2018a) Capítulo 4: Catálogo de la Flora Silvestre del Archipiélago. In: Penneckamp, D. *Flora Vasculare Silvestre del Archipiélago Juan Fernández. Primera Edición (versión electrónica)*. Planeta de Papel Ediciones, Valparaíso, Chile, pp. 48–61.
- Penneckamp, D. (2018b) Capítulo 5: Aspectos biogeográficos y de origen de la flora de Juan Fernández. In: *Flora Vasculare Silvestre del Archipiélago Juan Fernández. Primera Edición (versión electrónica)*. Planeta de Papel Ediciones, Valparaíso, Chile, pp. 64–113.
- Philippi, R.A. (1895) Plantas nuevas chilenas de las familias que corresponden al tomo IV de la obra de Gay: (continuación). *Anales de la Universidad de Chile* 90: 5–44.
- Ravenna, P. (2006) *Centaurea formosa* and *C. huascoënsis*, two new species of Chilean Asteraceae. *Onira* (10)15: 48–49.
- Reiche, C. (1904) Estudios críticos sobre la Flora de Chile. *Anales de la Universidad de Chile* 114: 455–481.
- Reiche, C. (1905) *Flora de Chile*, vol. 4. Imprenta Cervantes, Santiago de Chile, 466 pp.
- Rodríguez, R., Marticorena, C., Alarcón, D., Baeza, C., Cavieres, L., Finot, V.L., Fuentes, N., Kiessling, A., Mihoc, M., Pauchard, A., Ruiz, E., Sanchez, P. & Marticorena, A. (2018) Catálogo de las plantas vasculares de Chile. *Gayana Botánica* 75 (1): 1–430.  
<https://doi.org/10.4067/S0717-66432018000100001>
- Skottsberg, C. (1929) Notes on some recent collections made in the Islands of Juan Fernandez. *Acta Horti Gothoburgensis* 4: 155–171.
- Skottsberg, C. (1957) Une seconde espèce de *Centaurodendron* Johow. *Bulletin du Jardin botanique de l'État a Bruxelles* 27 (4): 585–589.  
<https://doi.org/10.2307/3666886>
- Stuessy, T., Rodríguez, R., Baeza, C.M. & López-Sepúlveda, P. (2017a) Chapter 5: Taxonomic Inventory. In: Stuessy, T., Crawford, D., López-Sepúlveda, P., Baeza, C. & Ruiz, E. (Eds.) *Plants of Oceanic Islands: Evolution, Biogeography, and Conservation of the Flora of the Juan Fernández (Robinson Crusoe) Archipelago*. Cambridge University Press, UK, pp. 57–97.  
<https://doi.org/10.1017/9781316841358>
- Stuessy, T., Crawford, D. & Ruiz, E. (2017b) Chapter 13: Patterns of Phylogeny. In: Stuessy, T., Crawford, D., López-Sepúlveda, P., Baeza, C. & Ruiz, E. (Eds.) *Plants of Oceanic Islands: Evolution, Biogeography, and Conservation of the Flora of the Juan Fernández (Robinson Crusoe) Archipelago*. Cambridge University Press, UK, pp. 209–275.  
<https://doi.org/10.1017/9781316841358>
- Susanna, A. & Garcia-Jacas, N. (2007) Tribus Cardueae. In: Kadereit, J.W. & Jeffrey, C. (Eds.) Kubitzki, K., *The Families and Genera of Vascular Plants*, vol. 8. Springer, Heidelberg, pp. 123–147.
- Susanna, A., Galbany-Casals, M., Romaschenko, K., Barres, L., Martín, J. & Garcia-Jacas, N. (2011) Lessons from *Plectocephalus* (Compositae, Cardueae-Centaureinae): ITS disorientation in annuals and Beringian dispersal as revealed by molecular analyses. *Annals of botany* 108 (2): 263–277.  
<https://doi.org/10.1093/aob/mcr138>
- Thiers, B. (2019) Index Herbariorum: A global directory of public herbaria and associated staff. *New York Botanical Garden's Virtual Herbarium*. Available from: <http://sweetgum.nybg.org/science/ih/> (accessed 25 March 2019)
- Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (Eds.) (2018) *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books.  
<https://doi.org/10.12705/Code.2018>
- Urbina-Casanova, R., Saldivia, P. & Scherson, R. (2015) Consideraciones sobre la sistemática de las familias y los géneros de plantas vasculares endémicos de Chile. *Gayana Botánica* 72 (2): 272–295.  
<https://doi.org/10.4067/S0717-66432015000200011>
- Zuloaga, F., Morrone, O. & Belgrano, M. (2008) *Flora del Cono Sur. Catálogo de las Plantas Vasculares*. Instituto de Botánica Darwinion, Buenos Aires, Argentina. Available from: <http://www.darwin.edu.ar/proyectos/floraargentina/fa.htm> (accessed 12 April 2019)