# *Veronica cymbalaria* (Plantaginaceae): A new species for the exotic flora of Chile

## *Veronica cymbalaria* (Plantaginaceae): una nueva especie para la flora exótica de Chile

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## Summary

**Background and aims**: Botanic gardens play a fundamental role in conservation due to the maintenance of seed and live plant collections. However, the exchange of ornamental plant seeds between botanic gardens can facilitate the entry of seeds of alien species with invasive potential. In 2018, during a visit to the collections of the National Botanical Garden (Chile), we discovered populations of an herb of the genus *Veronica* (Plantaginaceae). The aim of this paper is to report for the first time the presence of *Veronica cymbalaria* as a new exotic feral species for the flora of Chile.

**M&M**: Live material was studied and compared with the original description of the species. The collected material was deposited in the herbarium of the National Botanical Garden (JBN).

**Results**: *Veronica cymbalaria*, which grows abundantly in and around the biological collections of the National Botanical Garden, is described. Images of the species, a map of the site of occurrence and a key to distinguish *Veronica* species growing in Chile are included.

**Conclusions**: *Veronica cymbalaria* is reported for the first time for the flora of Chile. The distribution range of this alien species is extended to southern America. The genus *Veronica* is represented by ten allochthonous species in Chile.

## Key words

Alien plants, central Chile, flora of Chile, taxonomy, Valparaíso Region, weeds.

## Resumen

**Introducción y objetivos**: Los jardines botánicos cumplen un rol fundamental en conservación debido a la mantención de colecciones de semillas y plantas vivas. Sin embargo, el intercambio de semillas de plantas ornamentales entre jardines botánicos puede facilitar el ingreso de semillas de especies foráneas con potencial invasor. En octubre de 2018, durante una visita a las colecciones del Jardín Botánico Nacional (Chile), descubrimos poblaciones de una hierba del género *Veronica* (Plantaginaceae). El objetivo de este artículo es reportar por primera vez la presencia de *Veronica cymbalaria* como nueva especie exótica posiblemente asilvestrada para la flora de Chile.

**M&M**: Se estudió el material vivo y se comparó con la descripción original de la especie. El material colectado fue depositado en el herbario del Jardín Botánico Nacional (JBN).

**Resultados**: Se describe a *Veronica cymbalaria* que crece abundamente en las colecciones biológicas del Jardín Botánico Nacional y en sus alrededores. Se incluyen imágenes de la especie, un mapa del sitio de ocurrencia y una clave para distinguir a las especies de *Veronica* que crecen en Chile.

**Conclusiones**: *Veronica cymbalaria* se cita por primera vez para la flora de Chile. El área de distribución de esta especie exótica se extiende hasta el sur de América. El género *Veronica* está representado por diez especies alóctonas en Chile.

## Palabras clave

Chile central, flora de Chile, maleza, plantas exóticas, Región de Valparaíso, taxonomía.

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## Introduction

The role of botanic gardens in the world is diverse, including support for scientific research, involvement in education, public relations, improvement of human welfare, and plant conservation (Maunder *et al.,* 2001). However, botanic gardens have also been considered an avenue for the introduction of invasive allochthonous plants which is a major threat to global biodiversity (Dogra *et al*., 2010; Hulme, 2015). Seed exchange through *Index Seminum* constitutes one of the main methods to increase seed and live plant collections between botanic gardens. However, this method could also allow the introduction of invasive plant species that have been initially found in the botanic garden and subsequently naturalized in wider territories (Reichard & White, 2001).

The genus *Veronica* L. (Plantaginaceae) comprises about 450 species distributed worldwide, especially in the Northern Hemisphere, with centers of diversity in western Asia and New Zealand in Southern Hemisphere (Albach & Meudt, 2010). *Veronica* species have a wide variety of life forms, ranging from herbaceous annuals or perennials to shrubs or small trees (Albach & Meudt, 2010). Some species are naturalized in Argentina, southern Brazil, Chile, Paraguay and Uruguay (Zuloaga *et al*., 2018), and invasive in different habitats such as natural environments, roadsides, wetlands and cultivated fields (Wu *et al*., 2010; Takakura, 2013; Polechońska *et al*., 2020).

In Chile, the genus is represented by nine naturalized species, six perennial and three annual species, all of which are considered weeds (Romero & Klempau, 1981; Matthei, 1995; Rodríguez *et al*., 2018). The aim of this article is to report for the first time the presence of *Veronica cymbalaria* Bodard for the flora of Chile, an allochthonous annual herb growing feral in the biological collections of the National Botanical Garden, Viña del Mar, Chile. Besides, a taxonomic key of the *Veronica* species occurring in Chile is included.

## Materials and Methods

To determine the identity of this species, literature on *Veronica* species was reviewed: Borissova, 1955; Martínez-Ortega & Rico, 2000; Rojas-Andrés & Martínez-Ortega, 2016. Fresh material was collected and identified using the taxonomic key from Borissova (1955) and compared with nearby *Veronica* species described for Chile and Argentina (Romero & Klempau, 1981; Rodríguez *et al.*, 2018; Zuloaga *et al*., 2018). The collected material was herborized and deposited in the herbarium of the National Botanical Garden of Chile (JBN). Additionally, photographs of live plants are included, and the collection site was georeferenced. The species occurrence map was elaborated using the QGIS 3.16 program. A morphological key was constructed based on the literature mentioned above following the taxonomic treatment from Rodríguez *et al.* (2018).

## Results and Discussion

*Taxonomic treatment*

**Veronica cymbalaria** Bodard. *Mém. Véronique Cymb*.: 3. 1798. TYPE: "Veronica Chia, Cymbalariae folio, verna, flore albo, umbilico virescente" in Buxbaum, *Pl. Min. Cogn. Cent.* 1: 25, t. 39, f. 2. 1728 (Lectotype, designated by Sánchez Agudo *et al., Taxon* 61: 868. 2012); SPAIN. Málaga, Antequera, El Torcal, 30SUF6291, 1200 m, bajo matas de Crataegus, 6-IV-1999, E. Rico ER6809 (Epitype, SALA 109296! designated by Sánchez Agudo *et al., Taxon* 61: 868. 2012; isoepitype, MA 855279!).

Annual herbs, stems 10-30(60) cm tall, decumbent, covered with long papillae. Leaves long-petiolate, laminas semiorbicular, subcordate or reniform, with (5)7-8(9) lobes shallow obtuse, middle lobe slightly larger than others, base truncate or cuneate. Flowers solitary in the axil of regular or reduced leaves, pedicel 12-40 mm long, exceeding leaves, patent or recurved. Calyces 2.5-6 mm long, with sepals ovate or obovate, apex obtuse, margin ciliate. Corollas rotate, tube scarcely exceeding calyx, white, limb 4-lobed, 3 lobes orbicular-ovate and 1 lobe ovate. 2-stamens 1-2 mm long, exserted, filament curved, anthers ovoid. Styles 1-2 mm long, distinctly exserted, stigma capitate. Capsules subglobose, ovoid to ellipsoid, broader than long, 4-lobed, apex slightly emarginated, pilose. Seeds 1-2 per locule, globose, 2.5-3 mm wide, weakly rugose, cyathiform.

Phenology: *Veronica cymbalaria* (Fig. 1) begins to vegetate in June, flowers in mid-September, and fruits at the end of October.

Common names in Europe and United States: “gallinita blanca”, “glandular speedwell”, “pale speedwell”.

Distribution and habitat: For the moment, this species has only been observed in and around the National Botanical Garden of Viña del Mar (Valparaíso Region, Chile; Fig. 2), where it grows abundantly in anthropized sites such as cultivated land, near watercourses, roadsides and under plantations of *Pinus radiata* D. Don. The area of occupancy is about 7.35 ha with 15-20 individuals per $m^2$.

*Material studied*. CHILE. Valparaíso Region, Valparaíso Prov.: Viña del Mar, 33° 2′ 51.41′′ S, 71° 30′ 1.11′′ W, X-2018, Cisternas s.n. (JBN 3689); idem, 33º 2’ 42.69” S, 71° 30’ 1.69” W), XII-2019, Cisternas s.n. (JBN 4071).

*Veronica cymbalaria* is native to the Mediterranean

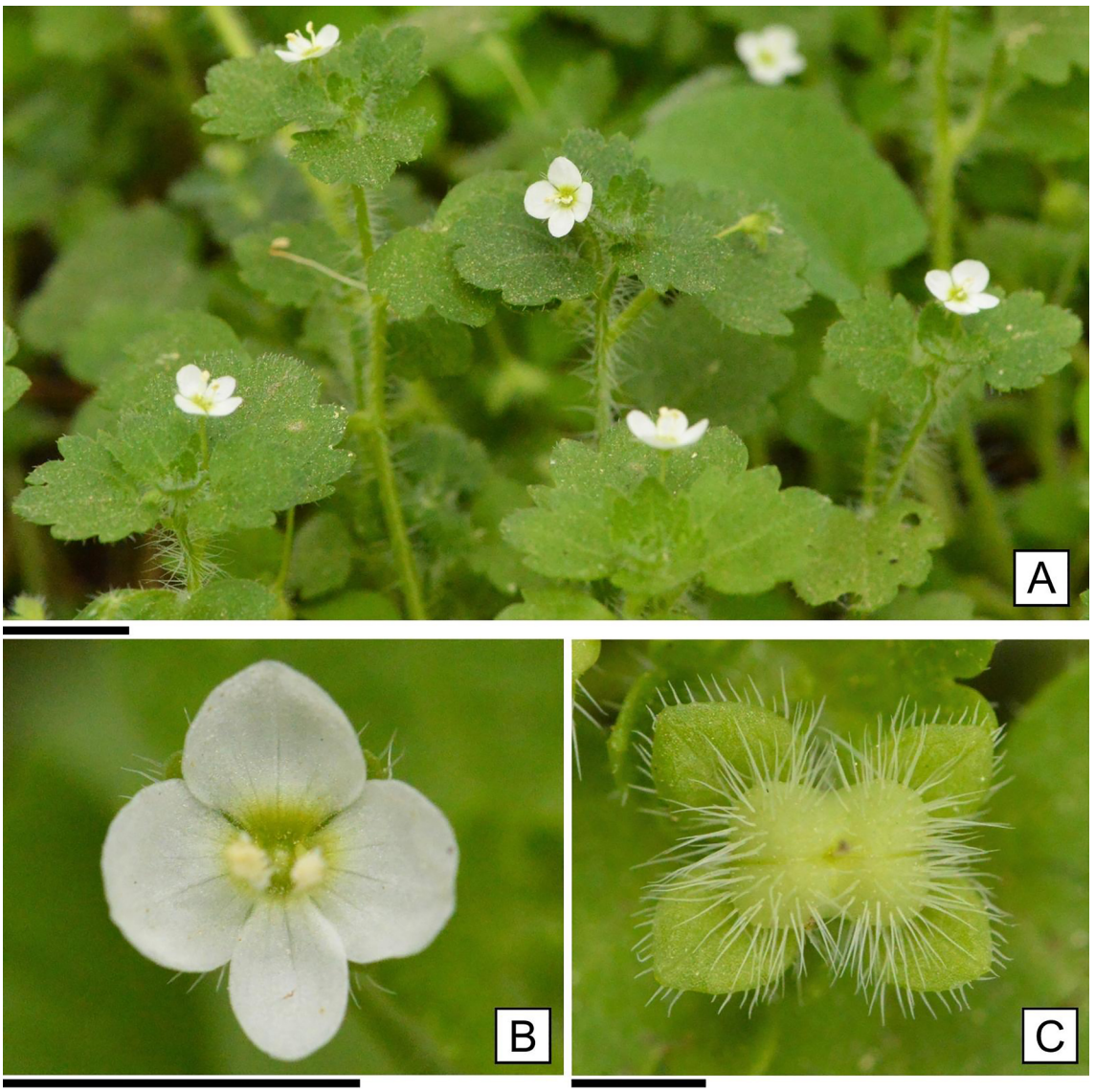


**Fig. 1**. *Veronica cymbalaria* Bodard. **A**: plant. **B**: flower, apical view. **C**: fruit, apical view. Escalas= A: 10 mm; B: 5 mm; C: 2 mm.

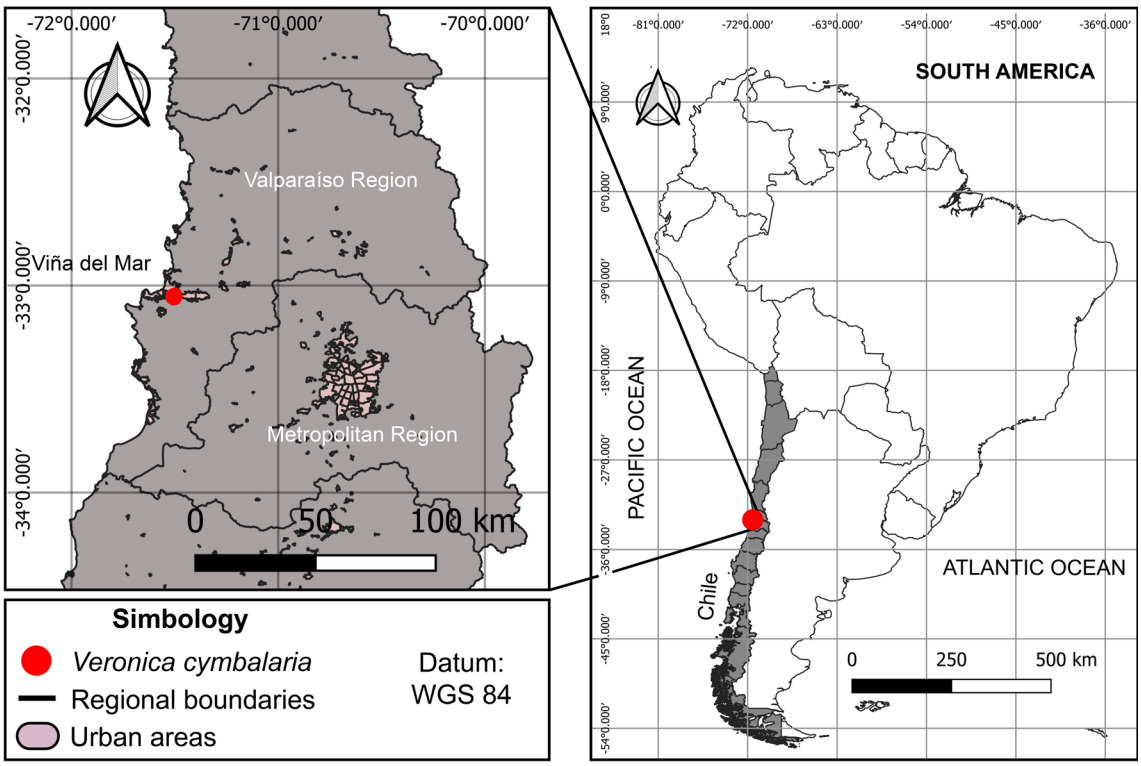


**Fig. 2**. Geographic location of *V. cymbalaria* in Chile.

basin (Albach, 2007), and has been considered uncommon in SW Spain (Valdés *et al.,* 2008), however it has naturalized in other areas of Europe, North Africa, North America and temperate Asia (Mito & Uesugi, 2004; GBIF, 2021). According to Juan *et al.* (1995), the germination percentage of *V. cymbalaria* is relatively low (<20%) about other species of the genus which could translate to lower invasiveness. However, this should be studied given that different species of the genus *Veronica* in Chile are considered highly invasive such as *V. anagallis-aquatica*, *V. arvensis*, *V. serpyllifolia* (Fuentes *et al.*, 2014). On the other hand, *Veronica cymbalaria* is similar to *V. persica*, however, they can easily distinguish by *V. cymbalaria* has a white corolla, and the capsules are shallowly 4-lobed and pilose. On the contrary, *V. persica* has a blue corolla with dark stripes and white centers, and the capsules are 2-lobed, flattened, and broadly heart-shaped.

**Keys to the *Veronica* species occurring in Chile**

1. Annual herbs. 2

2. Seeds cyathiform or scaphoid-concave. 3

3. Capsule subglobose. Seeds 1-2 per locule, cyathiform, globose, weakly rugose. *V. cymbalaria*

3'. Capsule compressed on sides. Seeds 3-12 per locule, scaphoid-concave, oblong, shallow rugose. *V. persica*

2'. Seeds flat or biconvex.

4

4. Stem subglabrous. Basal caulinar leaves cuneate at base, margin entire or subentire.

*V. peregrina*

4'. Stem pubescent. Basal caulinar leaves orbicular or subcordate at base, margin dentate or crenate-dentate.

*V. arvensis*

1'. Perennials herbs, rarely annuals in wet habitats.

5

5. Flowers in terminal racemes.

*V. serpyllifolia*

5'. Flowers solitary or in axillar racemes.

6

6. Calyx 4-partite. Capsule orbicular to oblong-ellipsoid, inflated, no laterally compressed. Seeds ellipsoid, biconvex or plano-convex.

7

7. Leaves sessile, sometimes basal leaves petiolate; semiamplexicaul, lamina often oblong or lanceolate, acute or acuminate apex. Inflorescence often glandular-pubescent.

*V. anagallis-aquatica*

7'. Leaves short-petiolate, lamina often orbicular or elliptical, acute or rounded apex. Inflorescence glabrous.

*V. beccabunga*

6'. Calyx 4- or 5-partite. Capsule deltoid-obcordate, ovoid, flat, laterally compressed. Seeds oval, oblong, flat, scaphoid, incurved on one side.

8

8. Plants confined to aquatic or marshy habits. Leaves glabrous, lamina linear to lanceolate.

*V. scutellata*

8'. Terrestrial plants. Leaves conspicuously pubescent, lamina ovate, oblong-ovate or suborbicular.

9

9. Leaves petiolate, lamina ovate or oblong-ovate, margin denticulate or serrate-dentate, sometimes subentire, base attenuate to cuneate-obtuse.

*V. officinalis*

9'. Leaves sessile or short petiolate, lamina ovate orsuborbicular, margin crenate-serrate, base rounded or subcordiform.

*V. chamaedrys*

## Conclusions

We report a new naturalized allochthonous plant species for the flora of Chile. According to this study, the genus *Veronica* is represented by ten allochthonous species in Chile. Early detection of introduced species allows decisions to be made to prevent the species from spreading and becoming invasive. It is important to take measures to eradicate this species with invasive potential in the JBN.

## Author Contributions

All authors have designed and performed the analysis, wrote the manuscript, and read and approved its final version.

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