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REVALIDATION OF *SOLANUM SANFURGOI* (SOLANACEAE), AN ENDEMIC SPECIES OF CENTRAL CHILE

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Abstract. Almendras, D.; M. Villalobos, S. Pérez, T. Ciudad & N. L. Moyano. 2025. Revalidation of *Solanum sanfurgoi* (Solanaceae), an endemic species of central Chile. *Darwiniana*, nueva serie 13(1): 5-12.

As part of a collaborative initiative focused on studying the local biodiversity of the Mataquito River in central Chile, rediscovery and revalidation of *Solanum sanfurgoi* is presented. This species was previously known only from a single specimen collected in 1895 and was considered a synonym of *Solanum grandidentatum* since 2023. An updated description of the species is provided, along with an illustration and a key for the Morelloid clade in central Chile.

Keywords. Endemism Neotropic; mediterranean flora; riparian flora; taxonomy.

Resumen. Almendras, D.; M. Villalobos, S. Pérez, T. Ciudad & N. L. Moyano. 2025. Revalidación de *Solanum sanfurgoi* (Solanaceae), especie endémica de Chile central. *Darwiniana*, nueva serie 13(1): 5-12.

A partir de una iniciativa colaborativa centrada en el estudio de la biodiversidad local del río Mataquito, Chile central, se presenta el redescubrimiento y revalidación de *Solanum sanfurgoi*, entidad solo conocida por un ejemplar coleccionado en 1895, y considerado sinónimo de *Solanum grandidentatum* a partir del año 2023. Se entrega una descripción actualizada de la especie con su respectiva ilustración y una clave para el clado Morelloide en Chile central.

Palabras clave. Endemismo; flora mediterránea; flora ribereña; Neotrópico; taxonomía.

INTRODUCTION

The ecosystems in central Chile host unique biodiversity hotspots (Myers et al., 2000). However, this exceptional concentration of endemic species is under significant and constant anthropogenic pressure. Therefore, the region has experienced forest loss, degradation, and fragmentation of native flora (Heilmayr et al., 2016; Miranda et al., 2016). One example is the Coastal Range of the Maule Region in central Chile (35°55'-36°20'S), where the Maulino forest meets the Chilean matorral, forming a diverse ecotone. This ecotone comprises highly endemic and relict taxa, which have significantly declined in the last few decades, having been replaced by large expanses of *Pinus radiata* D. Don plantations, where few native flora patches remain (Smith-Ramírez, 2004; Saavedra & Simonetti, 2005; Echeverría et al., 2006; Becerra & Simonetti, 2013; Castillo et al., 2018; Gómez et al., 2019; Meserve et al., 2020; Torres-Díaz et al., 2021).

The Mataquito River (35°3'S) in the Maule Region defines the northern boundary of the Maulino forest and transitions into the Mediterranean sclerophyllous vegetation zone (Smith-Ramírez, 2004). This area experiences a dry period of nearly seven months and typically hot and dry summers, with maximum daily temperatures reaching 31 °C in January.

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The annual rainfall is approximately 734 mm, occurring mostly in winter, with 675 mm falling between June and August (Espinoza et al., 2021). Occasional river floods also occur (Torres-Ramírez et al., 2017).

During several collaborative botanical surveys conducted with an indigenous organization in the spring of 2021 and summer of 2022 along the Mataquito riverside in the Coastal Range of the Maule Region, a noteworthy *Solanum* L. species with small white flowers was recognized.

Taxonomically, *Solanum* is by far the largest and most widely distributed genus of Solanaceae in South America (Frodin, 2004; Weese & Bohs, 2007; Palchetti et al., 2020). The Chilean flora includes 63 species of *Solanum*, 19 of which are endemic (Moreira-Muñoz, 2011). The Maule Region is home to 13 species (Rodríguez et al., 2018), including *Solanum sanfurgoi* Phil., a species previously known only from a single specimen collected by Ludovicus Sanfurgo from an unidentified location between Curanipe and Buchupureo on the southern coast of the Maule Region and described by Rudolph A. Philippi (1895: 10). Reiche (1909: 340) later placed this species in Group IV, Dun., subsection *Morella* Dun., based on the leaf morphology of the limited available material. The scarcity of records and limited samples has resulted in a poor understanding of the species. Recently, Knapp et al. (2023) designated a lectotype for *Solanum sanfurgoi* and synonymized it with *Solanum grandidentatum* Phil., a species native to the Andes of Ecuador that extends into northern Chile and Argentina. However, the two species differ in the characteristics of their indumentum and flower morphology. Furthermore, *S. grandidentatum* is not found at lower latitudes nor in central Chile, suggesting that *S. sanfurgoi* may represent a distinct taxon.

Here, we report the rediscovery of *Solanum sanfurgoi* from the riverbank of the Mataquito River in the Maule Region. We complement the original description by providing additional details on its distribution, habitat, photographs, illustrations, and conservation status assessment.

MATERIALS AND METHODS

Recently collected material was examined in relation to the taxonomic descriptions provided by Philippi (1895) and Reiche (1909) and compared with the related type specimens deposited at SGO (Thiers, 2024). Botanical terminology follows Beentje (2012). The conservation status was assessed according to the IUCN criteria (sensu IUCN, 2022), with the area of occupancy and extent of occurrence estimated using GEOGAT (http://geocat.kew.org; Bachman et al., 2011).

RESULTS

Taxonomic treatment

Solanum sanfurgoi Phil., Anales Univ. Chile 91: 10. 1895. TYPE. Chile. VII Región del Maule: Provincia de Cauquenes, between Curanipe and Buchupureo, unknown date, *L. Sanfurgo* (lectotype, SGO 000004598!, designated by Knapp et al., 2023, PhytoKeys 231: 1-342. (Figs.1, 2).

Subwoody perennial herb, branched at base and bushy in form, procumbent or decumbent, reaching up to 25 cm in height, odourless. Stems terete to ridged, not hollow, green, with pseudospinose processes along the angles, sparsely pubescent with simple, appressed, uniseriate eglandular 1-3 celled trichomes, these ca. 0.2 mm. Sympodial units difoliate, the leaves not geminate. Leaves simple, 1.8-4.0 × 1.0-1.5 cm, ovate-oblong, membranous to fleshy, green above, green pale below, veins light; adaxial surface sparsely pubescent with spreading, simple, uniseriate trichomes like those on stem evenly scattered along veins and lamina; abaxial surface sparsely pubescent along veins and sparsely along lamina with eglandular like those of the adaxial surface and stems; major veins 4-7 pairs; base obtuse to truncate, somewhat attenuate; asymmetric; decurrent on the petiole; margins crenate aserrate, especially in the lower 2/3, 5-7 smooth tooths that disappear at the apex; apex acute; petioles 0.5-0.8 cm, sparsely pubescent with simple uniseriate eglandular trichomes like those of the leaves and stems. Inflorescences 1.5-2.0 cm, lateral, internodal, and occasionally leaf-opposed, unbranched, sub-umbelliform, with 2-3 flowers at the tip, pubescent, with spreading trichomes like those on stems and leaves; peduncle 0.2-0.4 mm, straight; pedicels 5-13 mm, 1-2 mm in diameter, straight and spreading, articulated at the base; pubescent as the stems and leaves. Buds subglobose. Flowers 5-merous, all perfect. Calyx tube 3-4 mm, campanulate, the lobes equal, 1-2 × ca. 1 mm, elliptic to weakly spathulate, the apex rounded, adaxial surface sparsely puberulent, with trichomes like those on steam and leaves. Corolla 4-6.5 mm in diameter, white, stellate, nearly lobed and imbricate in the base, the lobes 2.5-3.3 × 1-1.5 mm, campanulate, occasionally planar at anthesis, densely papillate-puberulent on adaxial surface. Filament tube minute, the free portion of the filament ca. 0.5 mm, glabrous; anthers ca 1.5 × 0.5 mm, ellipsoid, connivent, yellow, poricidal at the tip. Ovary glabrous; style ca. 1 mm long × ca. 0.4 mm in diameter, glabrous, stigma capitate, reaching almost the same size as the anthers, pale green in live plants. Fruit a globose berry, 4-7 mm in diameter, glabrous, pericarp green to

purplish green at maturity, more or less shiny, with appressed calyx lobes. Fruit pedicel ca. 10 mm × 2.5 mm in diameter at the base, 1 mm in diameter at the apex; drops with mature fruits. Seed 10-15 per berry, ca. 1.4-1.6 × 1.0-1.2 mm, flattened and teardrop shaped with a subapical hilum,

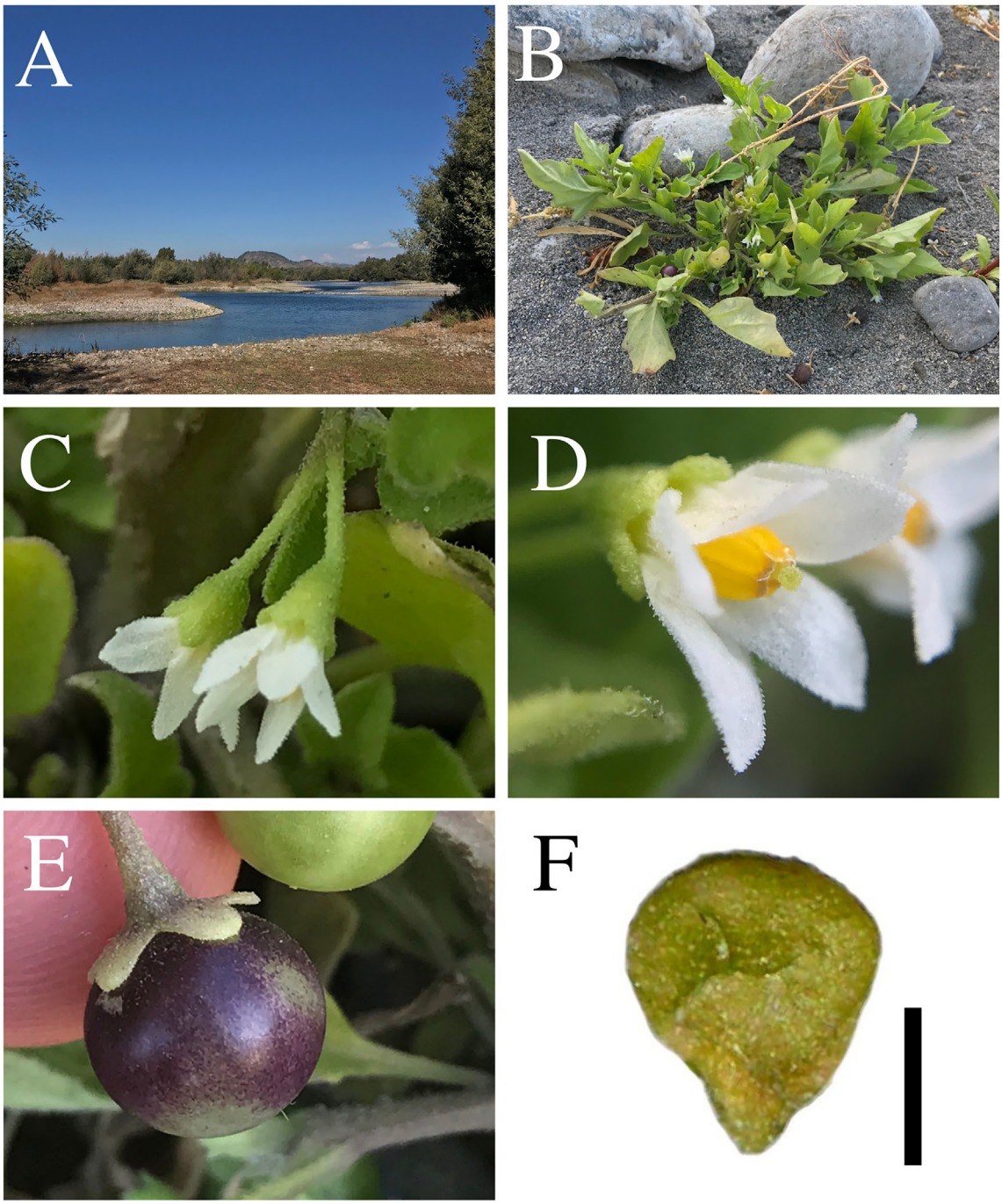

Fig. 1. *Solanum sanfurgoi.* **A.** Habitat, view of the riverbank of the Mataquito river. **B.** Habit of individual, growing in river sand and pebbles, showing signs of cattle grazing. **C.** Flowering branch. **D.** Flowers at full anthesis. **E.** Mature fruit. **F.** Seed. Scale bar 1 mm. Photographs by D. Almendras.

glabrous, greenish to brown, surface is smooth with occasional undulations and ridges, the testa cells round-rectangular in outline. Stone cells round, 2-4 per berry ca. 0.6 mm in diameter.

Distribution and habitat. This species is endemic to the Coastal Range of the Maule Region in central Chile, occurring at low elevations, and only know to inhabits riverside areas. It was previously known only from an unspecified locality between Curanipe and Buchupureo in the Cauquenes Province. The new location, situated near the Paula Bridge that connects the localities of Hualañé and Curepto, extends its distribution approximately 130 km north (Fig. 3). *Solanum sanfurgoi* inhabits the gravel beds of the floodplain adjacent to the Mataquito River, at 30 m elevation. This population consists of a few

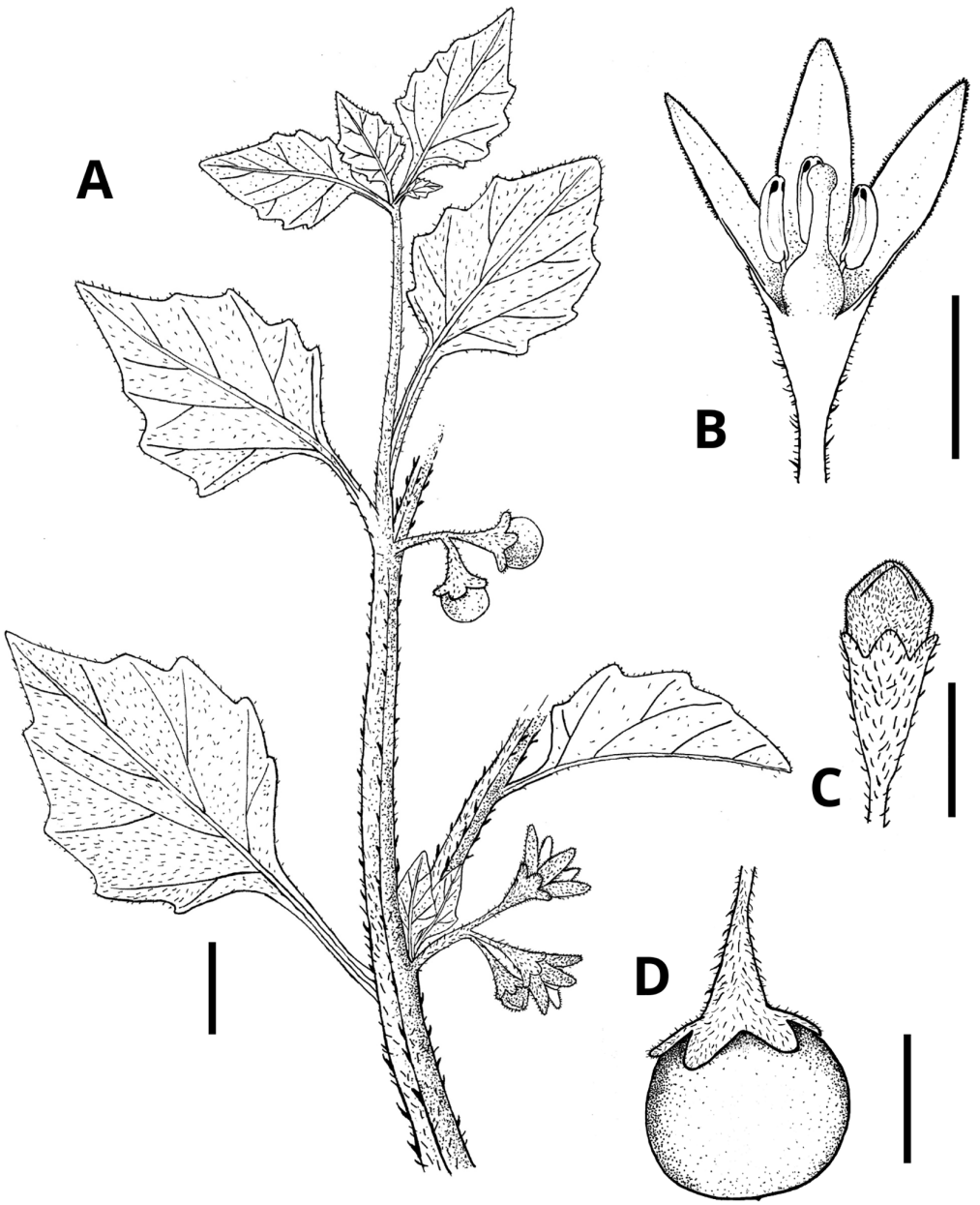

Fig. 2. *Solanum sanfurgoi*. **A.** Habit with flower, fruit and flower bud. **B.** Dissected flower. **C.** Bud. **D.** Mature fruit. Scale bars 1 cm. Drawing by Diego Almendras.

solitary plants that are well-separated from one another.

Phenology. Mature flowers and fruits were observed between February and May. Buds, immature fruits, and ripe fruits were also recorded during these months. Mature plants were only observed in late austral summer, from February to May. Indoor seed germination occurs in early November.

Ecology. No pollinators were observed; however, *Solanum sanfurgoi* is presumed to be pollinated by bees and flies. The plants inhabit a dynamic riverbank, which undergoes significant changes in shape throughout the year. It is likely that fruit dispersal is influenced by river dynamics. Mature plants may be submerged underwater during the winter when the river expands. No local uses of this herb have been reported, although the small fruit is edible and has a mild bittersweet flavour.

Observations. *Solanum sanfurgoi* was synonymized under *Solanum grandidentatum* (Knapp et al., 2023). However, *S. sanfurgoi* differs from *S. grandidentatum* by having a short, appressed calyx lobes with rounded tips, and a small corolla that is entirely white on both sides, with the adaxial surface sparsely puberulent, as noted by Philippi (1895). The corolla in *S. sanfurgoi* is small (4-6.5 mm), campanulate, and not reflexed at anthesis, unlike *S. grandidentatum,* which has large flower (12-15 mm) with a greenish yellow eye, as reported by Knapp et al. (2023). The indumentum in *S. sanfurgoi* is simple and homogenous, consisting of short (0.2 mm),

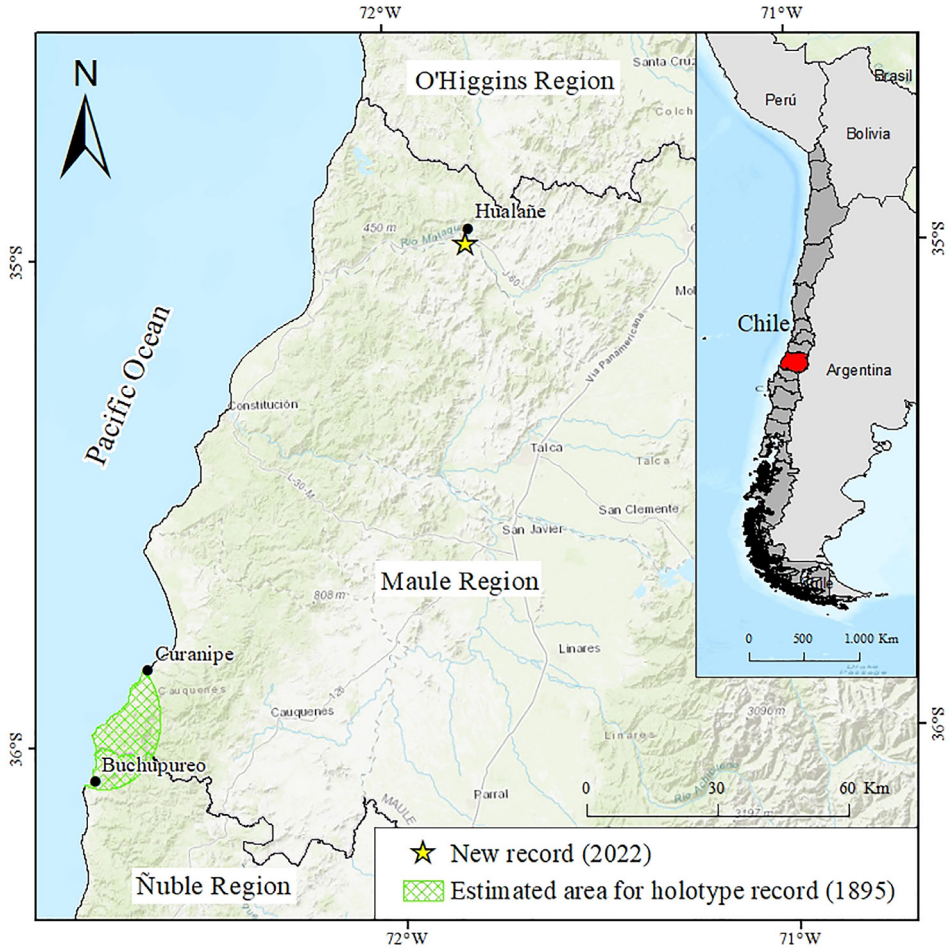

Fig. 3. Location of *Solanum sanfurgoi* in Hualañé, Curicó province, and estimated location for the 1895 record at the coast of Cauquenes province, Maule Region, Central Chile.

exclusively non-glandular trichomes distributed across the plant. In contrast, *S. grandidentatum* is characterised by pubescence with white, glandular, simple trichomes (0.5-1 mm) that are sticky to touch, features not observed in wild *S. sanfurgoi.*

Conservation Status. *Solanum sanfurgoi* can be classified as Critically Endangered (CR) under the IUCN (2022) categories and criteria B1+B2a (i,ii,iii). Despite exploring several sites along the Mataquito River from spring 2021 to summer 2022, only twelve individuals were recorded, all in the vicinity of the Paula Bridge. The Area of Occupancy is 4 km² (grid resolution 2 km), and the Extent of Occurrence is 0.566 km². All plants exhibited signs of herbivory, and we observed cattle and horses left by locals in the river. Major threats include inappropriate use of the riverside, habitat change and fragmentation, cattle grazing, and the introduction of invasive species. Locals reported modifications to the riverbank over the past decade due to the recent invasion of *Acacia dealbata* Link.

Additional specimens examined. CHILE. **VII Region Maule**. Prov. Curicó, Hualañé, Paula bridge J82, in gravel riverbank in both sides of the river, 34°59'19.75" S; 71°48'12.00" W, 33 m a.s.l., 7.V.2022, *D. Almendras 15267* (EIF).

DISCUSSION AND CONCLUSIONS

Since its description in 1895, *Solanum sanfurgoi* has not been collected, and the date and place of its original collection remains unknown. Other populations may potentially exist in sandy and gravel riverbanks of rivers and streams in the Coastal Range of the Maule Region, between the Tinguiririca and Mataquito Rivers, including the Chovellen, Curanipe, and Curanilahue Rivers. However, this area is highly anthropized, and the habitat is likely modified (Díaz et al., 2019; Díaz-Gavidia et al., 2022; Pacheco et al., 2022). Mature plants of *S. sanfurgoi* can be identified in the field by their fleshy leaves, inflorescences with two to three small, hairy, stellate white flowers, which is not seen in other *Solanum* species in the region. The presence of succulent simple leaves, pseudospines, ridged stems, stellate white flowers, and fleshy round berries with stone cells makes *S. sanfurgoi* a candidate for the Morelloid clade (Särkinen et al., 2015, 2018; Knapp et al., 2019, 2023), and molecular analyses are needed to fully understand its phylogenetic relationships and position. In the Maule Region, *S. sanfurgoi* is morphologically similar to *S. nitidibaccatum* Bitter, a native species of southern South America (Särkinen et al., 2018), but differs in having completely white flowers on both surfaces, a stellate corolla, a shorter and thicker stigma, a calyx with lobes rounded at the tip, and fewer, shorter, non-glandular trichomes, while *S. nitidibaccatum* is covered with viscid-pubescent with translucent simple trichomes, with a remarkable flower with a yellow-green central eye with black "V" or "U" shaped edged in the lobe sinuses, as seen in Knapp et al. (2019).

Knapp et al. (2023) superfluously synonymized *S. sanfurgoi* with *S. grandidentatum*, which typically occurs in open areas at medium to high elevation in the Andes of Ecuador, Peru and northern Chile, and is unlikely to reach low elevations in the Mediterranean valleys of Central Chile. Philippi described *S. grandidentatum* in 1891 from Paroma and Sibaya in Tarapacá, North Chile. Later, in 1895, he described *S. sanfurgoi* from the Maule Province, without suggesting any relationship between these two taxa, despite the limited material available.

Reichei (1909) recognised these two taxa in his Group IV as a subsection of Morella. He identified *S. sanfurgoi* as a perennial plant with umbellate flowers, distinguishing it from *S. grandidentatum* which he described as an annual plant with bifurcated inflorescences, next to *S. furcatum* Dunal. Therefore, *S. sanfurgoi* should be reinstated and recognized as a distinct species. The unexpected rediscovery of this plant underscores the importance of collaborative field initiatives with local communities and the need for exploratory and conservation actions in rural areas of Central Chile, where neighbouring regions remain poorly known.

Key to the Morelloid clade of *Solanum* in Central Chile (adapted from Knapp et al., 2023)

1. Violet flowers……2

1. White flowers……3

2(1). Leaves pinnatifid. Stems glabrous, fruits smaller than 1 cm ……*S. echegarayi*

2. Leaves slightly lobed, deeply lobed margin incurved. Stems with dense trichome, fruits from 1-1.5 cm ……*S. sinuatirecurvum*

3(1). Leaves deeply lobed……*S. radicans*

3. Leaves entire or sinuate-lobed…… 4

4(3). Plants with non-glandular trichomes. Non-sticky stems and leaves; white corolla, sometimes with greenish-yellow star, without coloured margins…… 5

4. Plant with glandular trichomes. Sticky stems and leaves; corolla always with a central greenish-yellow star and black or purple margins…… *S. nitidibaccatum*

5(4). Inflorescence peduncle divided into two cymes from the base, with up to 14 flowers. Corolla 1-1.3 cm long…… *S. furcatum*

5. Inflorescence peduncle not divided at the base, with up to 8 flowers. Corolla 0.2-0.5 cm long……6

6(5). Plant up to 1.8 m tall. Stems green to slightly purple, sometimes with small spines. Leaves 3.5-10.5 ×1.0-4.5 cm, margins entire or sinuate-dentate. Inflorescences with 4-6(-8) flowers at the tip; peduncle 0.5-.08 cm long. Non-native…… *S. americanum*

6. Plant up to 25 cm tall. Stems green, without spines. Leaves 1.8-4.0 ×1.0-1.5 cm, margins crenate-serrated. Inflorescences with 2–3 flowers at the tip; peduncle 0.2-0.4 cm long. Endemic……
……*S. sanfurgoi*

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CONFLICT OF INTEREST

The authors declare they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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