



A new species of *Petunia* (Solanaceae) from Corrientes, Argentina

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Abstract

We describe and illustrate a new species of *Petunia*, *P. correntina*, from southwestern Corrientes, Argentina, in southern South America. The species has funnel-form corolla with whitish-green tube and purple lobes, apex of longer filaments nearly straight, apex of medium filaments curved laterally and opposite each other, connivent anthers, bluish pollen, stigma located between anthers of the large and medium stamens and inflexed pedicels in fruiting stage. This suit of characters is unique into the genus. Few populations are known, inhabiting sandy soils of the Paraná basin. A key to the Argentinian species of *Petunia* with purple corolla is given.

Keywords: IUCN conservation status, Paraná basin, Petunieae

Introduction

Petunia Jussieu (1803: 215) is one of the most known ornamental plants, with a hybrid, *P. x hybrida* Vilmorin (1863: 615) being widely cultivated around the world (Stehmann *et al.*, 2009). The genus was described based on material collected by Commerson in the banks of the Río de la Plata, in Montevideo, Uruguay (Fries, 1911). Since then many species have been described, and its circumscription has also changed (Wijsman & Jong, 1985; Wijsman, 1990; Stehmann *et al.*, 2009). *Calibrachoa* Cervantes (in La Llave & Lexarza 1825: 3) was segregated from *Petunia*, keeping the species with less lobed calyx, reciprocative corolla aestivation and basic chromosome number of $x=9$; *Petunia* retained the species with deeply lobed calyx, imbricate corolla aestivation, and basic chromosome number of $x=7$ (Stehmann *et al.*, 2009). From about originally 40 species (Hunziker, 2001), nowadays 14 species are accepted in *Petunia*, distributed all (Stehmann *et al.*, 2009), but one, *P. mantiqueirensis* Ando & Hashimoto (1994: 340), in the subtropical region of the southern South America. Two centers of diversity were primarily recognized, associated with open vegetation, one in highlands of southern Brazil, in the northern Rio Grande do Sul and Santa Catarina, and the other in the lowlands, including the Pampa region of the southern Rio Grande do Sul state (Stehmann *et al.*, 2009).

The revision of the *Petunia* to the Flora of Argentina recognized seven species (Stehmann & Greppi, 2013), counting a doubtful endemic species *P. patagonica* (Spegazzini 1897: 557) Millan (1941: 544) (Reck-Kortmann *et al.*, 2015). *Petunia axillaris* (Lamarck 1793: 7) Britton, Sterns & Poggenburg (1888: 38), with white salverform corolla tube and yellow pollen, is a widespread species, easy to find in almost all provinces. The species belonging to *P. integrifolia* complex, with purplish funnel-form corolla and bluish pollen, have a roughly allopatric latitudinal distribution, with *P. integrifolia* (Hooker 1931: 3113) Schinz & Thellung (1915: 361) growing near to the Uruguay river in the Entre Ríos and southeastern Corrientes provinces, *P. inflata* R.E. Fries (1911: 35) and *P. interior* T. Ando & Hashimoto (1996: 217) growing more to the northeast, and *P. occidentalis* R.E. Fries (1911: 37) in the northwest of the country.

In a recent expedition to collect *Petunia* samples along the Paraná river, we found a population of *Petunia* very distinct morphologically from all known *Petunia* species. This material was recognized as a new species and it is here described and illustrated. A key to the Argentinian species of *Petunia* with purple corolla is given.

Materials and methods

We revised the main herbaria in southern and southeastern Brazil (BHCB, FLOR, ICN, MBM, R, RB, SP), Argentina (BAF, BAA, BAB, CTES, CORD, LIL, SI) and Uruguay (MVFA, MVM), as well as type material deposited in B, BM, BR, G, K, L, M, NY, S, and W (acronyms following Thiers 2018). To make detailed descriptions and illustrations, we cultivated plants in the greenhouse and got fresh flowers to dissect. We use the IUCN Red List Categories and Criteria (IUCN 2017) for the assessment of the conservation status of the species. Estimate of extent of occurrence (EOO) and area of occupancy (AOO) were made with GeoCat tool (www.geocat.kew.org; Bachman *et al.* 2011) using the cell size of 2 km² to calculate the AOO.

Results and discussion

Petunia correntina Greppi & Stehmann, *sp. nov.*

Figures 1–4.

Type:—ARGENTINA. Corrientes. Dep. Goya. Ruta Nacional 12, km 832, tramo de ruta entre la ciudad de Goya y la Ruta Provincial 24, costado del camino, suelo arenoso. Coordenadas: 29,1759 S, 58,8739 W, Altitud 56m. 30-11-2017, flor y fruto, *J. A. Greppi, J. C. Hagiwara & S. Otomo 1581* (holotype BAB!; isotypes BHCB!, ICN!, MBM!, RB!).

Diagnosis:—*Petunia correntina* is morphologically related to *P. integrifolia*, *P. inflata* and *P. interior*; all belonging to the *Petunia integrifolia* complex. It can be distinguished from them by the whitish throat (faucis) and the arrangement of the stamens into the corolla, with apex of longer filaments nearly straight and apex of medium filaments curved laterally and opposite each other.

Herb, 0.15–0.25 m tall or little more when decumbent upon adjacent plants, stems branched from the base, cylindrical, basal stems up to 0.7 m long and ca. 4 mm in diameter, prostrate, ascendant to the apex, lateral stems 1–2 mm in diameter, ascendant, all stems glandular-pilose, hairs variable in length, up to 1 mm long, straight, white; internodes 6–20 mm long. Leaves 10–28 x 8–18 mm, some basal leaves up to 40 x 20 mm, alternate, elliptical to broadly elliptical, rarely sub-orbicular or obovate, apex acute to obtuse, rarely rounded, attenuate at the base, pseudopetiolate, shortly glandular-pilose on both sides, nerves sunken adaxially and prominent and glandular-pilose abaxially, margin ciliate, glandular-pilose. Inflorescence of sympodial units, each composed of a single flower associated with 2 opposite leaf-like bracts. Flowers small, 20–24 mm long; peduncles 9–17 mm long, patent to ascendant, glandular-pilose; calyx 9–12 mm long, deeply 5-lobed, tube 2.5–3.5 mm, lobes 4.7–7.5 x 1–3.5 mm, glandular-pilose, subequal, linear-oblong, apex obtuse. Corolla funnel-shaped, tube 15–20 mm long, the inner surface glabrous, green, normally white on top, the outer surface glandular-pilose, whitish, greenish downwards, with marked purple venation on both sides, venation externally prominent, limb 18–29 mm in diameter including the lobes, slightly zygomorphic, purplish, lobes 5, obtuse or truncate, the apex abruptly short acute. Stamens 5 (2 long, 2 medium, 1 short), filaments glabrous, whitish, greenish at the base, violet on extreme top, adnate to the base of the corolla about 3–4 mm, free portion of the longer pair 8–9 mm, slightly curved laterally at the upper portion, apex nearly straight, free portion of the medium pair 6–7 mm, curved laterally and opposite each other at the apex, free portion of the short filament 4–5 mm, straight; anthers ca. 1 mm long, with thecae elliptic, free in almost their length, channeled, facing upwards, the anthers of the long and medium stamens connivent or very shortly separated with each other respectively; pollen bluish. Pistil glabrous; ovary 2 x 1 mm, ovoid, greenish; style 10–11 mm long, whitish, greenish at the base and violet to purple on extreme top, curved in the upper part; stigma rhomboid to obconical, located between anthers of long and medium stamens, dark green. Pedicel inflexed in the fruiting state; capsule 6 x 2–3 mm, ovoid, ca. 1/2 greater than the calyx tube length, apex acute; seeds blackish, ca. 0.5 mm, minute, globose, seed coat reticulate.

Paratypes:—ARGENTINA. Corrientes: Dep. Esquina, RN12 y río Corrientes, 02-12-1974, *A. Krapovickas, C.L. Cristobal & J. Irigoyen 27071* (CTES!); Estancia La Victoria, 29°31'53.67'' S 58°59'14.91'' W, 06-10-2008, *H.A. Keller, M. Franco & J. Araujo 6189* (CTES!). Dep. Goya, Isla del Diablo, 26-11-1945, *O. Boelcke 1457* (SI!); paso Borda, 26-07-1972, *R. Carnevalli 3229* (CTES!); Buena Vista, 21 km al S de Goya, sobre RN12, 22-11-1979, *A. Schinini, R. Vanni & G. Normann 18956* (CTES!).

Distribution and ecology:—*Petunia correntina* is only known for few localities in the southwest of Corrientes, Argentina (Fig. 4). The species grows in a small area of open grassland and sandy soils between Corrientes and Paraná rivers.

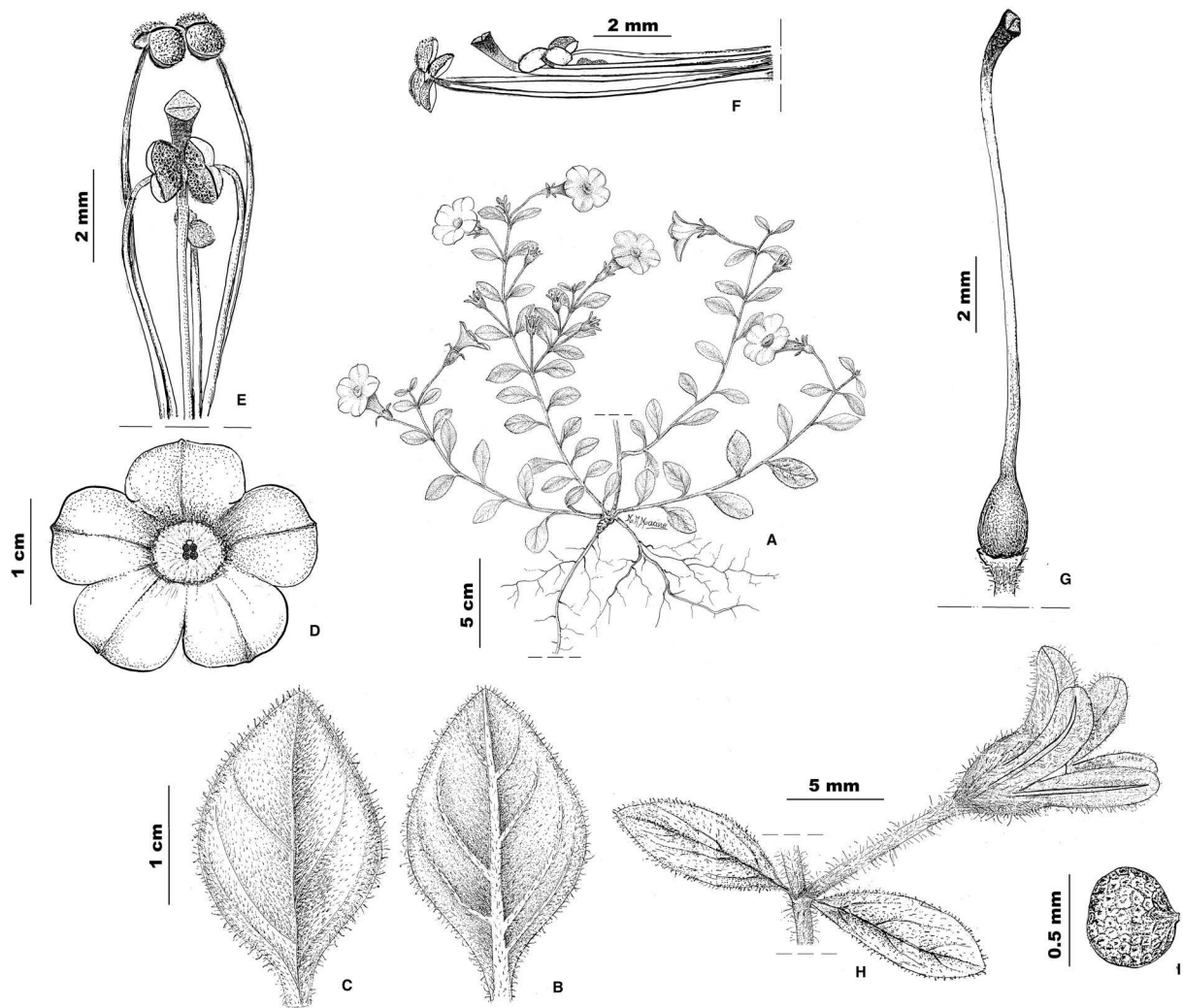


FIGURE 1. *Petunia correntina*. A. Habit; B–C. Leaves; D. Flower in frontal view; E–F. Stamens and stigma arrangement inside of the corolla tube, in upper and side view, respectively; G. Gynoecium; H. Immature fruit, showing the erect pedicel and the accrescent calyx; I. Seed. (All drawings based on Greppi *et al.* 1581).

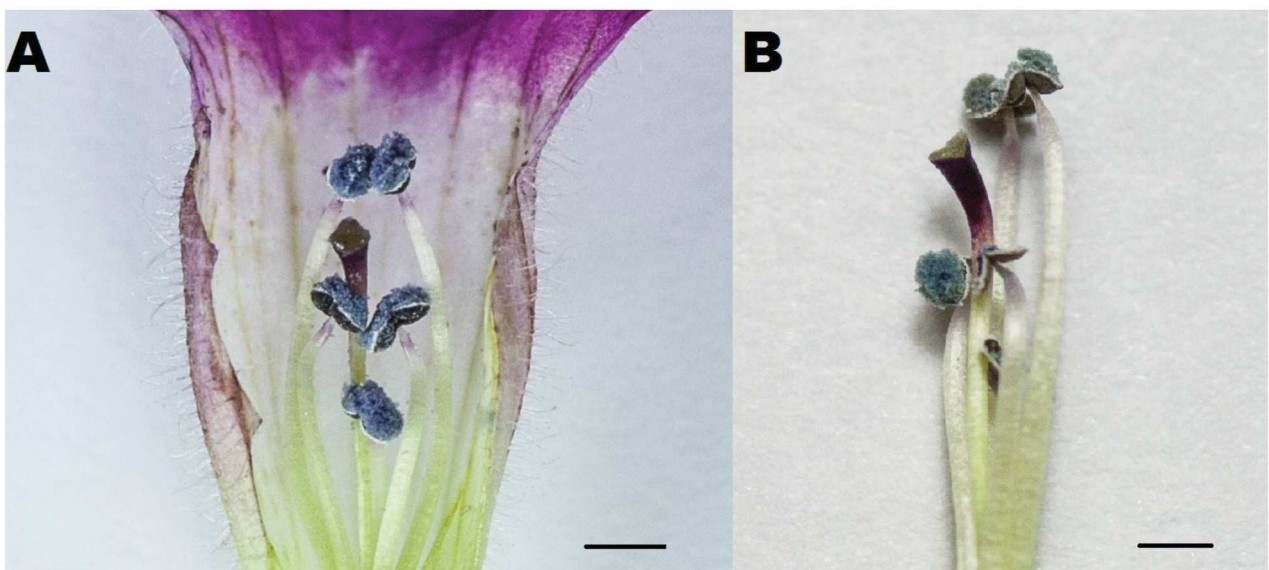


FIGURE 2. *Petunia correntina*: A. Upper view of stamens, style and stigma. B. Side view of stamens, style and stigma. (Bar 1 mm).



FIGURE 3. *Petunia correntina* vs. others species of *Petunia* with purple flowers from northeastern Argentina: A. *Petunia correntina*, side view of flower; B. Frontal view of the flower. C. *Petunia integrifolia*, frontal view of the flower. D. *Petunia inflata*, frontal view of flowers. E. *Petunia interior*, frontal view of flower. F. *Petunia scheideana* Smith & Downs (1964: 439), frontal view of flower. (Bar 1 cm).

Phenology:—In the wild, the species was found flowering and fruiting on November, during the spring. The cultivated plants were in full bloom from spring to beginning of winter.

Preliminary conservation status:—Endangered (EN), Criteria B1, 2 a, b (ii, iii, iv), D. Following the IUCN criteria (2017), *P. correntina* should be included in the Endangered category, because 1) the region is botanically well explored, 2) the species is only known from three localities, with small and restrict populations, not included in any protected area; 3) EOO and AOO were estimated at 598 km² and 12 km², respectively; 4) the quality of the habitat is decreasing. The main threats in this area are the breeding of cattle, and forest crops of *Pinus* and *Eucalyptus*, that change completely the original grassland ecosystem.

Etimology:—The specific epithet means native from “Corrientes”, an Argentinian province located on the eastern shore of the Paraná river.

Notes:—*Petunia correntina* is morphologically recognized by its decumbent stems, funnel-form corolla with whitish throat (fauces) and purplish lobes, stigma positioned between the pairs of medium and larger stamens, and inflexed pedicels in fruiting stage. It seems to be related to species of the *P. integrifolia* complex from northeastern Argentina, southeastern Paraguay, southern Brazil and Uruguay, here defined as *P. integrifolia*, *P. inflata* and *P. interior*. These species are primarily allopatric, but possible zones of contact and introgression occur, as reported for the neighboring state of Santa Catarina in Brazil (Ando *et al.* 2005).

Two floral characters are very distinctive in *P. correntina*, the color of the corolla tube and the apex of the filaments. The new species has a whitish green corolla fauces with marked purple venation, a feature not seen in the other species of the complex showing pale or dark purple fauces with darker stripes (Ando & Hashimoto 2005). In dry material, the contrast between the whitish tube and purple limb is very clear, remembering the color of the flowers of some species of *Calibrachoa* (Fregonezi *et al.* 2012). In the androecium, the filaments of long and medium stamens are slightly curved laterally at the upper portion with the anthers in contact or very close to each other respectively, the apex of longer filaments is nearly straight and the apex of medium filaments is curved laterally and opposite each other (Figures 1E, 2A–B). In frontal view of the flowers the anthers of the long stamens are not positioned to the front of the stigma because the filaments are not incurved at the apex. In contrast, the filaments of *P. integrifolia*, *P. interior* and

P. inflata are incurved at the apex and the anthers of longer stamens are in contact to each other in front of the stigma, which is then not visible in frontal view of the flowers (Ando & Hashimoto 1996, Ando *et al.* 2005).

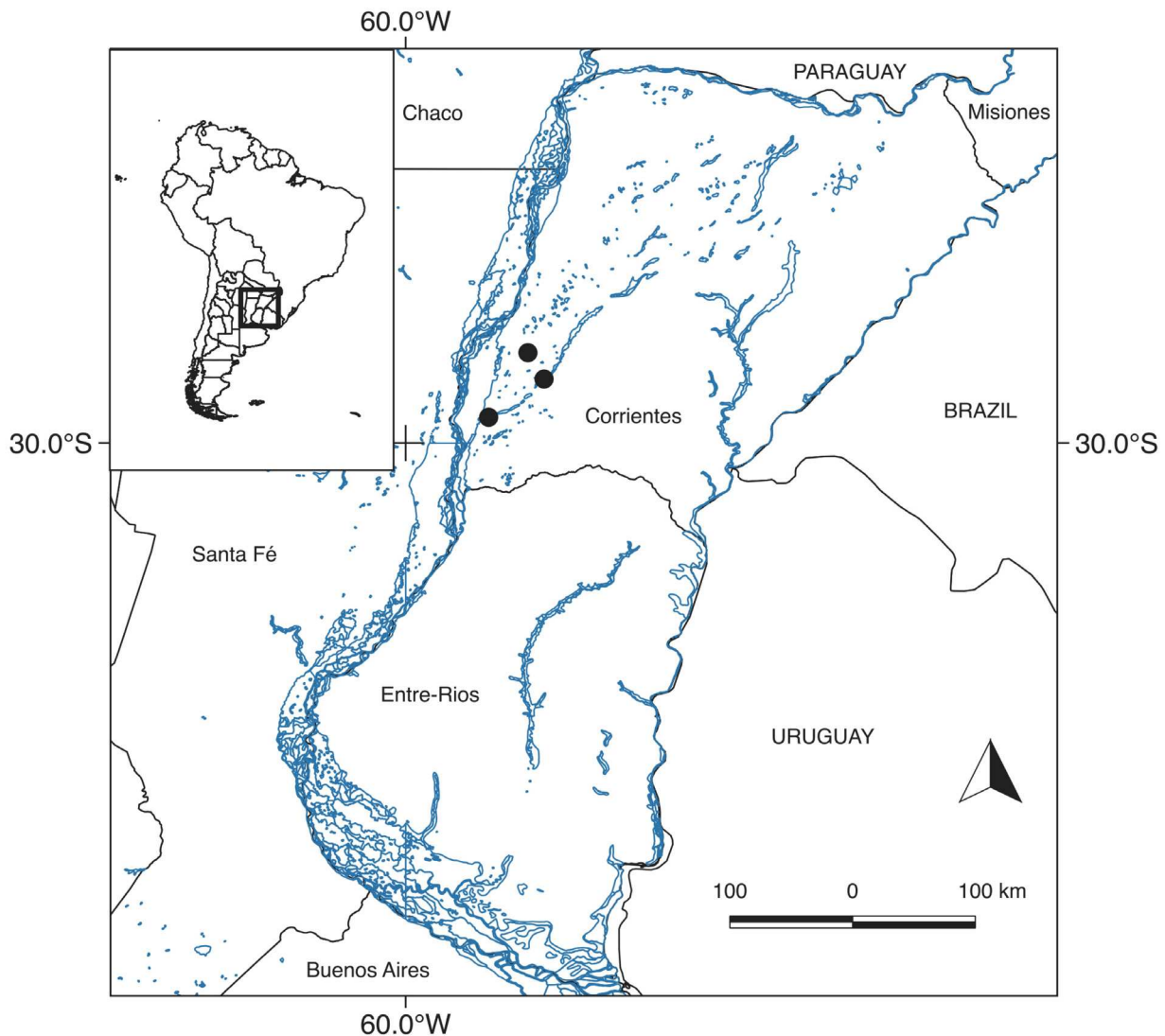


FIGURE 4. Map showing the occurrence points (black circle) of *Petunia correntina* in southwestern Corrientes, Argentina.

Other distinctive character showed by the new species is the inflexed pedicel in fruiting stage, shared with two purple-flowered species, *P. inflata* and *P. occidentalis* (Tsukamoto *et al.* 1998; Ando *et al.* 2005). This trait has been used to separate *P. inflata* from other species of the *P. integrifolia* complex, although some individuals can show the pedicel in an intermediate position, suggesting hybridization events (Ando *et al.* 2005). *Petunia inflata* can be distinguish by the pale purple corolla tube (*vs.* whitish-green in *P. correntina*), the filaments incurved at the apex (*vs.* straight at the apex) and by the clavate-discoid stigma (*vs.* rhomboid to obconical stigma), while *P. occidentalis* presents corolla limb 18–20 mm in diameter (*vs.* 18–29 mm), corolla tube adnate to stamens ca. 8 mm (*vs.* 3–4 mm) and stigma vertically bilobed (*vs.* non lobed) (Tsukamoto *et al.* 1998; Ando 2005).

We highlight the distinct geographical distribution of the *Petunia* species with purplish flowers from northeastern Argentina related to the new species here described. *Petunia interior* occupies the region with red soils in higher altitudes in northeastern Misiones, and also grows in southern Brazil (western Santa Catarina and northwestern Rio Grande do Sul) (Ando & Hashimoto 1996; Ando *et al.* 2005). *P. inflata* grows in the influence area of the Paraguay river and the north portion of the Paraná and Uruguay rivers in eastern Formosa and Chaco, northeastern Santa Fe, southern Misiones and northern Corrientes, reaching southeastern Paraguay and southern Brazil (northwestern Rio Grande do Sul) (Stehmann & Greppi 2013). *Petunia integrifolia* has a more southward distribution, in the influence area of the Uruguay river in southeastern Corrientes and eastern Entre Ríos provinces in Argentina, Santa Catarina and Rio Grande do Sul in southern Brazil, and Uruguay (Stehmann & Greppi 2013).

The population of the new species inhabits open grassland environment with sandy soils in a small area in southwestern Corrientes, between the *P. inflata* and *P. integrifolia* areas, where there are no other species of the genus, but it shares the environment in this area with *Calibrachoa thymifolia* (Saint-Hilaire 1824: 220) Stehmann & Semir (1997: 419), a common species in the region (Greppi *et al.* 2013, 2015). Efforts to collect new samples in the region must be intensified to find new populations and to reassess the conservation status of this beautiful and ornamental species of *Petunia*.

Key for the Argentinean taxa of *Petunia* with purple flowers:

1. Pedicel in fruiting stage inflexed 2.
- Pedicel in fruiting stage deflexed 4.
2. Corolla limb small, 18–20 mm diameter, base of corolla-tube cylindrical, stigma bilobed..... *P. occidentalis*
- Corolla limb normally greater than 20 mm diameter, corolla tube funnel shaped, stigma not bilobed 3.
3. Corolla limb 30–40 mm diameter, interior corolla tube pale purple, filaments incurved at the apex *P. inflata*
- Corolla limb 18–29 mm diameter, interior corolla tube whitish-green, apex of longer filaments nearly straight, apex of medium filaments curved laterally and opposite each other *P. correntina*
4. Stigma whitish, bilobed and situated at the same level as anthers of the long pair of stamens or above of them reaching the opening of the corolla tube; pollen whitish to greenish *P. scheideana*
- Stigma green or bluish, knuckle-shaped and situated between anthers of long and medium pair of stamens; pollen bluish 5.
5. Corolla limb 25–40 mm diameter, interior corolla-tube dark purple, lobe of anther flat, lateral stems ascendant *P. integrifolia*
- Corolla limb 17–23 mm diameter, interior corolla-tube pale purple, lobe of anther channeled, lateral stems prostrate *P. interior*

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