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Primulina linearicalyx (Gesneriaceae), a new species from Guangxi, China

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Abstract

Primulina linearicalyx from Wuming County, Guangxi, is illustrated and described here. It is morphologically close to *P. linearifolia*, *P. pseudolinearifolia* and *P. longgangensis*, but it can be easily distinguished by the exceptionally long and linear-lanceolate to linear calyx lobes. The chromosome number for this species, being reported the first time, was determined to be $2n=36$. The conservation status of the new species was assessed as “Critically Endangered” (CR) based on IUCN criteria.

Key words: chromosome number, endemism, flora of Guangxi, new taxon, taxonomy

Introduction

Living plants of this unknown species were firstly collected from the local Chinese medicine market of Wuming County in 2007 by Mr. Jia-Cheng Liu, a tourist and a horticultural hobbyist from Hong Kong. When flowering in 2008, Mr. Liu sent photographs and specimens to WF and WYG (IBK) for identification. We considered it representing an undescribed species because it proved to be distinct from every known species of the former *Chirita* Buch.-Ham. ex Don (1822: 89) and now *Primulina* Hance (1883: 169). However, no one had yet been able to find the locality of this species in Wuming County. Although information concerning the provenance of this species was unconfirmed, it was informally documented nearly six years before (Wei *et al.* 2010). Fortunately, one of the authors (LBD) had the opportunity to investigate the wild flowers in Liangjiang Township, Wuming County, Guangxi, and collected one taxon of Gesneriaceae Rich. & Juss. in de Candolle (1816: 182) at the foot of the Damingshan Mountain in April 2011. At first, she considered it was *Primulina linearifolia* (W.T.Wang 1982: 136) Yin Z.Wang (2011: 61) based on vegetative character only. When she went back to the locality in autumn the same year, she found that it was not *P. linearifolia* but an entirely different species. She immediately contacted with WF and WYG, who rejoiced in surprise in that what she found was exactly the one which was informally described before but who was unable to locate it. Based on the floral characters, this taxon belongs to *Primulina* and it is similar to *P. linearifolia*, *P. pseudolinearifolia* W.B.Xu & K.F.Chung (2012: 4) and *P. longgangensis* (Wang 1982: 171) Yan Liu & Y. Z.Wang in Wang *et al.* (2011: 61).

After consulting national floras (Wang *et al.* 1990, 1998) and other literatures (Li & Wang 2004, Wei *et al.* 2010), and recently published relevant papers on new *Primulina* species, e.g. *P. linearifolia*, *P. longgangensis*, *P. pseudolinearifolia*, etc, as well as herbarium specimens (ANU, BJFU, CDBI, HN, IBK, IBSC, KUN, PE, VMN, CTC, MO, CDBI, HIB, HGAS, SZ), It is confirmed that this plant represents a new species of *Primulina*, which is described and illustrated here.

Material and methods

Chromosome preparations and cytological protocols

Living plants of *Primulina linearicalyx* were collected and introduced to cultivate in the nursery of GCCC (in Guilin

Botanical Garden) from one wild population at the type locality in Wuming County for chromosomal analysis as part of a project on counting the chromosome numbers of some endemic *Primulina* species from Guangxi. Voucher specimens were deposited in IBK. Actively growing root tips were pretreated in 2 mmol/L 8-hydroxyquinoline at room temperature for ca. 6 h, and then fixed overnight in Carnoy I (3 parts absolute ethanol: 1 part glacial acetic acid) at 4°C for at least 30 min. Then, the macerate chromosomes were stained in 2% acetic orcein and 1 mol/L hydrochloric acid (10: 1). The best metaphase plates were photographed using an Olympus BX51 microscope with Olympus DP71 camera attachment (Olympus, Tokyo, Japan). The chromosome numbers were counted in at least 20 cells with well-spread chromosomes from 10 root tips taken from 10 respective leaf cuttings out of living plant of the type specimen, namely *B.D.Lai 111016-1* (IBK).

Taxonomic Treatment and Karyology

Primulina linearicalyx F.Wen, B.D.Lai & Y.G.Wei, *sp. nov.* (Figs. 1 & 2)

Diagnosis:—Morphologically similar to *Primulina linearifolia*, *P. pseudolinearifolia* and *P. longgangensis* in leaf shape, but differs in having fewer flowers per cyme (1–3 flowers for *P. linearicalyx* vs. 8–24 flowers for *P. linearifolia*, 4–12 flowers for *P. pseudolinearifolia* and 2–15 flowers for *P. longgangensis*; the same order hereinafter), longer calyx lobes (25–30 × 2.5–3 mm vs. 3.2–4 × 0.6–1.1 mm, 5–6 × ca. 1 mm and 5–8 × 0.9–1.5 mm), longer filaments (ca. 1.5 cm long vs. ca. 1 cm, 1–1.2 cm and ca. 1.5 cm long).

Type:—CHINA. Guangxi: Wuming County, Liangjiang Town, in crevice on the rock face, 23°26′26.61″N, 108°23′15.89″E, ca. 135 m, 23 May 2010, *B.D.Lai 111016-1* (holotype: IBK!, isotype: IBK! ANU!).

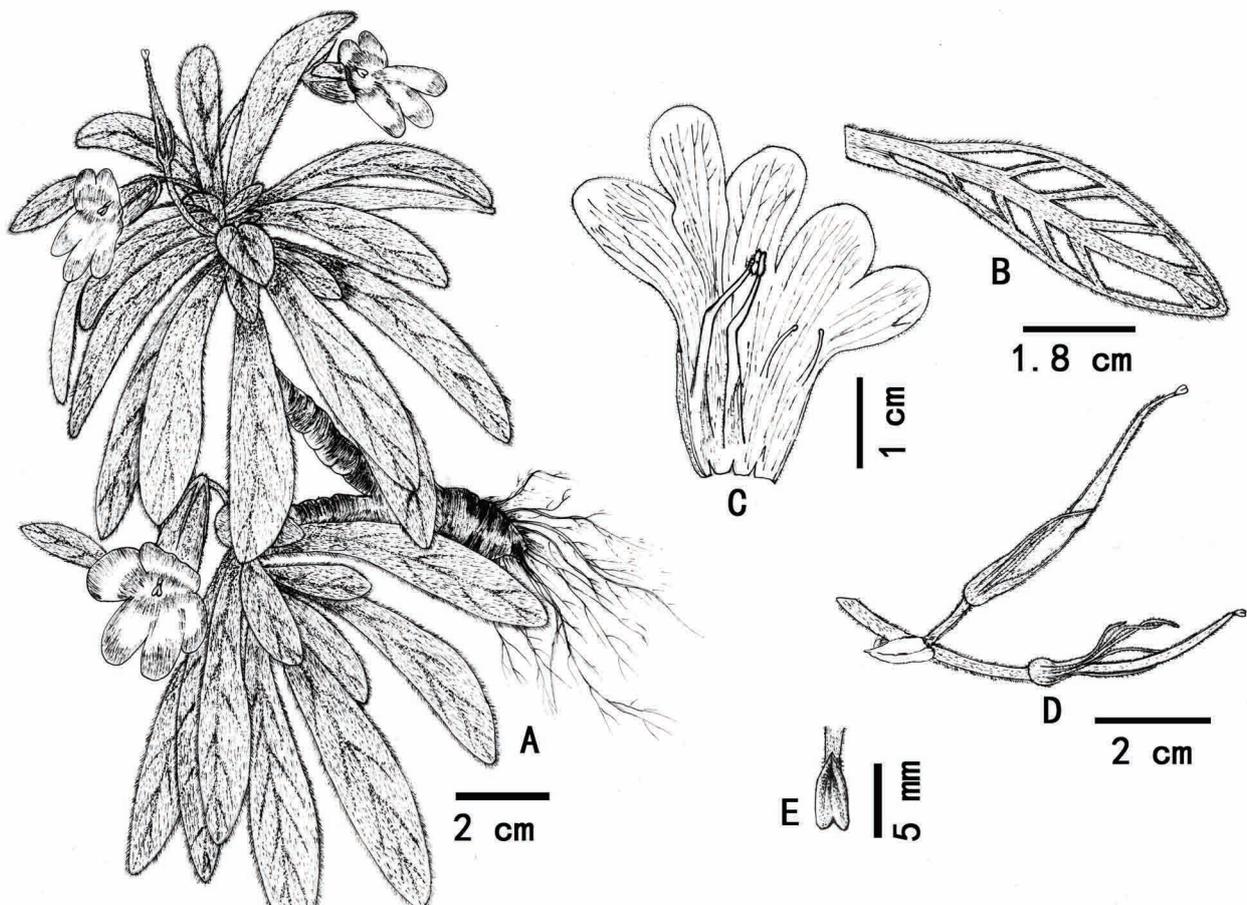


FIGURE 1. *Primulina linearicalyx*. A. Habit, B. Abaxial leaf surface showing the prominent veins, C. Opened corolla showing stamens and staminodes, D. Cyme, showing bracts, calyx lobes and pistil, E. Stigma.

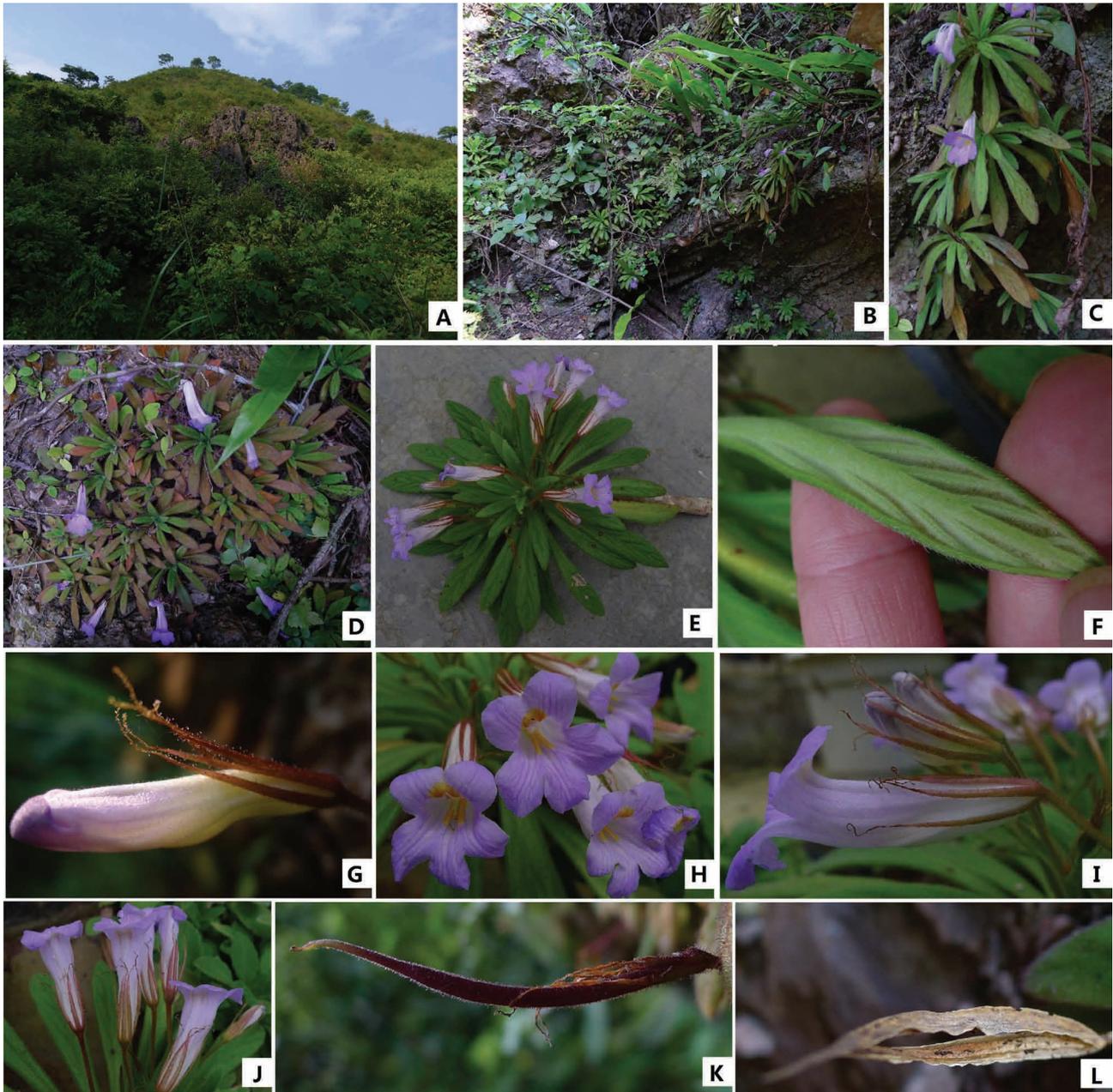


FIGURE 2. *Primulina linearicalyx*. **A.** Type locality at the foot of the Damingshan Mountain, **B.** Habitat, **C & D.** Habit, **E.** Flowering plant in cultivation, **F.** Abaxial leaf surface, **G.** Bud and calyx lobes, **H.** Frontal view of flowers, **I.** Lateral view of corolla and calyx lobes, **J.** Top view of corolla and calyx lobes, **K.** Immature capsule, **L.** Mature and dehiscent capsule.

Perennial herbs. Rhizomatous stem cylindrical to subterete, 3–10 cm long or longer, 1–2.2 cm in diam., often branched in the middle or at the base. Leaves 12–27, congested at apex, subsessile to sessile; leaf blade fleshy, linear-oblong to linear-elliptical, $3.5\text{--}7.5 \times 1\text{--}1.3$ cm, with appressed white pubescence on both surfaces, apex obtuse to round, base attenuate to acute, margin entire and revolute, lateral veins 3–5 on each side, adaxially inconspicuous or conspicuous, abaxially conspicuously elevated. Cymes 3–5, axillary, usually simple, sometimes 1-branched, with 1–3 flowers; peduncle 4–5 cm long, 1.8–2.2 mm in diam., sparsely with brownish purple patent glandular and eglandular pubescence; bracts 2, free, opposite, lanceolate to broadly lanceolate, $8\text{--}11 \times 4\text{--}5$ mm, apex acute, margin entire, adaxially pubescent, abaxially glabrous, caduceous; pedicel 10–25 cm long, 1.5–2 mm in diam., sparsely with glandular pubescence and almost appressed eglandular pubescence. Calyx 5-parted nearly to the base, all lobes slightly fused at base and swollen, lobes linear-lanceolate to linear, $25\text{--}30 \times 2.5\text{--}3$ mm, abaxially with brownish purple glandular pubescence, adaxially glabrous, apex attenuate and ended in a fine filamentous tip, margin entire. Corolla 3.5–4 cm long, purplish pink, upper part of the interior of the corolla with two yellowish brown short stripes, throat also with two yellow stripes, outside sparsely with transparent glandular short pubescence and purple eglandular puberulence, tube

2–2.5 cm long, 1.2–1.5 cm in diam. at the mouth; limb distinctly 2-lipped, adaxial lip 2-parted deeper to the proximal half, lobes broadly ovate to semicircular, margin repand when fresh, 6–8 × 7.5–8.5 mm, abaxial lip 3-lobed also deeper to the proximal half, lateral two lobes obliquely ovate, 10–12 × 8–10 mm, central lobe nearly rounded to oblong, 9–10 × 8.5–9.5 mm, lobe margins repand when fresh as the adaxial lip. Stamens 2, adnate 0.9–1.0 cm above the corolla base; filaments ca. 1.5 cm long, slightly geniculate near middle, glabrous; anthers coherent, nearly reniform, dorsifixed, densely bearded, ca. 3 mm long; staminodes 2, adnate to 1–1.1 cm above the corolla tube base, 6–6.5 mm long, apex capitate, glabrous. Disc ca. 1.5 mm in height, margin entire, glabrous. Pistil 3.5–5 cm long, ovary 2.5–3.5 cm long, 3–5 mm in diam., densely glandular-pubescent; style 1–1.5 cm long, 1.5–2 mm in diam., glandular-pubescent; stigma obtrapeziform, 4–5 mm long, apex 2-lobed. Mature capsule linear, 5–6 cm × ca. 3 mm, puberulent.

Distribution and habitat:—*Primulina linearicalyx* has only been found at the type locality, Liangjiang Township, Wuming County, Guangxi, China. Only one population was observed, with all individuals growing on dry and sun-exposed rock surfaces of sedimentary rock at elevation of ca. 130 m.

Proposed conservation Red List category:—All the plants of *Primulina linearicalyx*, less than 300 mature individuals, are clustered together in a fairly small site at the foot of the Damingshan Mountain near a village. They grow on a big isolated sedimentary rock, which is surrounded by the local farm of cassava. It is so prone to the activities of local people that the category of ‘Critically Endangered’ (CR, B2a + E) is proposed here according to the IUCN red list criteria (IUCN 2011).

Phenology:—This new species was observed flowering in late October to early November and fruiting in December.

Etymology:—The epithet is referring its very long and linear lanceolate calyx lobes, a diagnostic character in the genus *Primulina*.

Vernacular name:—Xiàn È Bào Chūn Jù Tái (线萼报春苣苔).

Relationships:—*Primulina linearicalyx* is morphologically similar to *P. linearifolia* in vegetative characters and *P. pseudolinearifolia* in reproductive organs (Table 1). It is interesting that the three species share similar habitat in usually exposed to sunlight on limestone outcrops (for *P. linearifolia* and *P. pseudolinearifolia*) or conglomerate rocks (for *P. linearicalyx*). The similarity in leaf morphology might be the adaptation to the sunlight exposure and arid soil and air in the dry season, which leads to reduced lamina area and thicker leaves for water storage as observed in many other xerophytes. These three species and *P. longgangensis*, another species with narrowly long and thick leaves, clustered into one clade in a phylogenetic study (Kang *et al.* 2014 where *P. pseudolinearifolia* was identified being *P. luochengensis* as indicated in Xu *et al.* 2011 & 2012). This suggest a shared origin for the dry and sunny habitat adaptation, rather than convergent evolution of this trait.

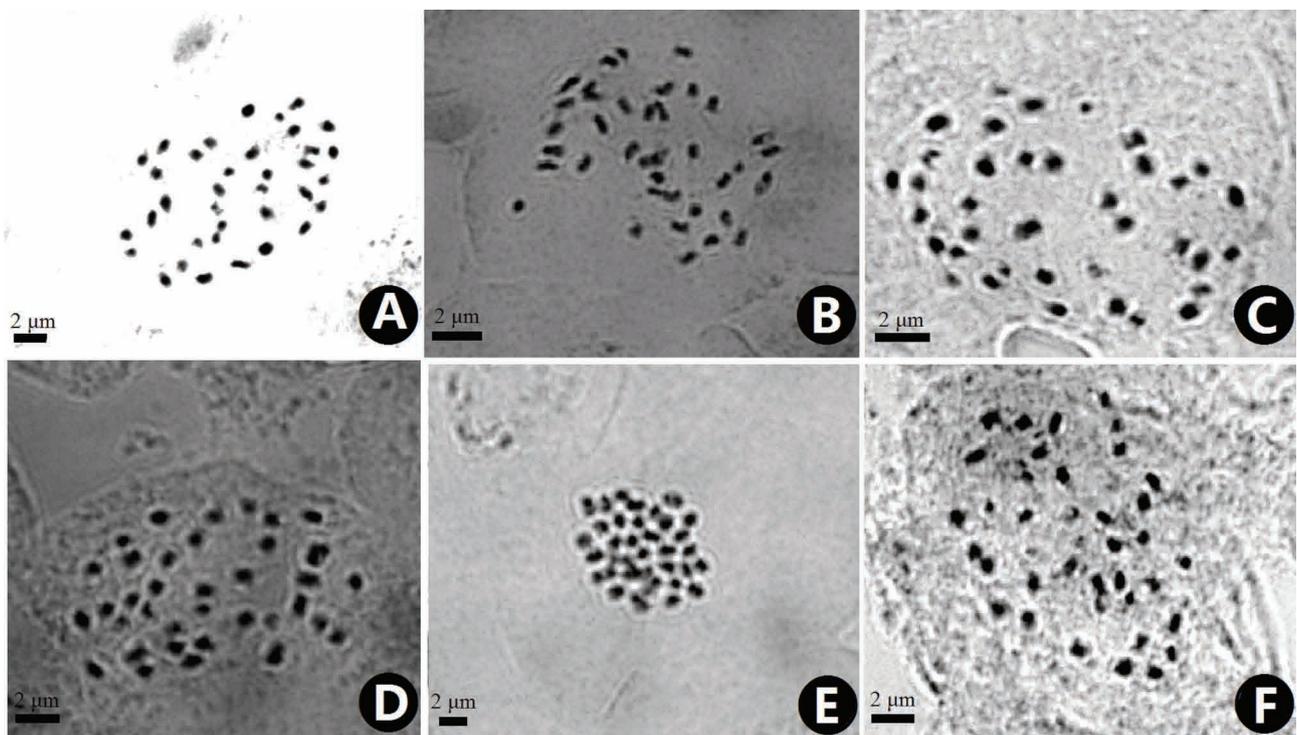


FIGURE 3. Somatic chromosomes at metaphase of *Primulina linearicalyx*. A to F showing microphotographs from different cells with 2n=36, from roots of leaf cuttings of B.D.Lai 111016-1, IBK.

Karyology:—In the concept and classification of Lima-de-Faria (1980), the chromosomes of *Primulina* are considered to be small in size with their range between 0.6–2.4 μm (Liu *et al.* 2012). The somatic chromosomes of *P. linearicalyx* at metaphase are illustrated in Figure 3. It was identified the first time as diploid with chromosome number of $2n=36$. The size of its chromosomes fell within the range of the genus, *i.e.* 0.8–1.0 μm while with only a slight variation in size within the complement (Fig. 3). So far, almost all known chromosome numbers of *Primulina* including this new species represent a diploid number of $2n=36$ with a basic number of $x=18$ (Möller & Pullan 2015 onwards).

TABLE 1. Morphological comparison of *Primulina linearicalyx* with *P. linearifolia*, *P. pseudolinearifolia* and *P. longgangensis*.

Characters	<i>P. linearicalyx</i>	<i>P. linearifolia</i>	<i>P. pseudolinearifolia</i>	<i>P. longgangensis</i>
Cyme				
Flower number / per cyme	1–3	8–24	4–12	2–15
Peduncle length	4–5 cm	5.5–15 cm	4–8 cm	3–15
Peduncle indumentum	sparsely brownish purple patent glandular and eglandular pubescence	densely white glandular puberulence and villous	white glandular-pubescent and sparsely pilose	white glandular pilose to puberulent
Bracts				
Shape	lanceolate to broadly lanceolate	lanceolate to ovate	linear-lanceolate	linear to lanceolate or obovate
Size	8–11 \times 4–5 mm	4–10 \times 1.6–5 mm	4–6 \times 1–1.5 mm	4–20 \times 0.5–6 mm
Indumentum	adaxial surface pubescent, abaxial surface glabrous	adaxial surface puberulent to glabrous, abaxial surface glabrous	pubescent on both surfaces	abaxial surface pilose to puberulent
Calyx lobes				
Size	25–30 \times 2.5–3 mm	3.2–4 \times 0.6–1.1 mm	5–6 \times ca. 1mm	5–8 \times 0.9–1.5 mm
Shape	linear-lanceolate to linear	linear-lanceolate	linear-lanceolate	linear-lanceolate
Indumentum	abaxial surface brownish purple glandular-pubescent, adaxial surface glabrous	abaxial surface white puberulent, adaxial surface glabrous	abaxial surface white glandular-pubescent, adaxial surface sparsely glandular-pubescent to glabrous	adaxial surface minutely appressed white puberulent and glandular puberulent, abaxial surface white puberulent near apex
Corolla				
Size	3.5–4 cm long	ca. 2.4 cm long	3–4.2 cm long	3.4–4 cm long
Color	purplish pink	white to pale bluish	purplish	white to pink, red-purple
Indumentum	outside sparsely short transparent glandular pubescent and sparsely purple puberulent, inside glabrous	outside transparent puberulent, inside basally sparsely puberulent	outside transparent pubescent, inside sparsely pubescent	outside glabrous to puberulent, inside puberulent or glabrous below stamens
Stamens				
Filaments length	ca. 1.5 cm	ca. 1 cm	1–1.2 cm	ca. 1.4 cm

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