



## A new *Specklinia* (Orchidaceae: Pleurothallidinae) from Costa Rica and Panama

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### Abstract

A new species of *Specklinia* from the Cordillera de Talamanca in southern Costa Rica and western Panama is described and illustrated. *Specklinia absurda* most closely resembles *Specklinia fuegi*. It differs from that species in the pendent, single flowered inflorescence, whitish yellow sepals with red-pink veins and yellow apex, red petals with translucent margins, pandurate-trilobed, unguiculate lip with a distinct papillose isthmus below the anterior lobe, and reniform, erose, erect lateral lobes, with a Y-shaped thickened, hirsutulous apical callus. The affinities of this species to other *Specklinia* species are discussed.

### Resumen

Se describe e ilustra una nueva especie de *Specklinia* de la Cordillera de Talamanca en el sur de Costa Rica y el oeste de Panamá. *Specklinia absurda* es similar a *Specklinia fuegi*, sin embargo se diferencia principalmente en la inflorescencia pendulosa de una sola flor, las flores con los sépalos blanco-amarillentos con venas roja-rosadas, el ápice amarillo, los pétalos de color rojo con bordes translúcidos y el labelo pandurado-trilobulado, unguiculado, con un istmo conspicuamente papiloso detrás del lóbulo anterior, los lóbulos laterales reniformes, erosos, erectos en posición natural, con un callo apical, engrosado, hirsutuloso en forma de Y. Se discuten las afinidades de esta especie dentro de *Specklinia*.

**Key words:** *Specklinia absurda*, *Sylphia*, Talamanca, taxonomy, *Trichosalpinx*, systematics

### Introduction

The orchid genus *Specklinia* Lindley (1830: pl. 8) was redefined by Pridgeon and Chase (2001) to include species of several infrageneric concepts of the polyphyletic genus *Pleurothallis*, including sects. *Hymenodanthe* Barbosa Rodrigues (1892: 9), *Tribuloides* Luer (1986: 91), *Muscariae* Luer (1986: 89), *P.* subgenus *Empusella* Luer (1986: 41), *P.* subgenus *Pseudoctomeria* Kränzlin (1925) and genus *Acostaea* Schlechter (1923: 22, 102). In Pridgeon (2005), *Specklinia* was defined as a genus of around 200 species, ranging from Mexico and West Indies to Brazil and Bolivia. A later account of the genus by Barros and Trettel Rodrigues (2009) yielded about 420 binomials. *Specklinia* in this sense is variable both in terms of vegetative and floral morphology, but can be recognized by plants with ramicauls shorter than leaves, an abbreviated stem with an annulus, sepals and petals mostly membranaceous, lateral sepals connate for at least half their length and convergent, petals mostly obtuse and entire (never acuminate or lanceolate) and wider above the middle, and a linear to sub-rectangular lip hinged to the column foot. The column has a toothed androclinium, a pair of prominent rounded apical wings, ventral anther and stigma, and pollinaria that are flattened towards the base and lack both caudicles and viscidium.

Luer (2006) regarded the new circumscription of Pridgeon and Chase (2001) as a polyphyletic aggregation of many taxa. Instead, he proposed to split *Specklinia* into ten genera with five major groups: *Muscarella* Luer (2006: 94), *Pabstiella* Brieger & Senghas (1976: 195), *Panmorphia* Luer (2006: 144), *Sarcinula* Luer (2006: 201) and *Specklinia* and four other monospecific genera created for the rest of the morphologically “aberrant” species in addition to *Sylphya* Luer (2006: 227), a genus of four species with long tailed sepals and crested or spiculate ovaries. Few authors have used these segregate genera, and circumscription of most has still to be evaluated with DNA analyses.

## Materials and methods

This study was conducted at Jardín Botánico Lankester (JBL) of the Universidad de Costa Rica, NCB Naturalis—NHN Leiden University, The Netherlands and Herbario UCH of Universidad Autónoma de Chiriquí, Panamá. Specimens at JBL (from living and spirit collections) and dried and spirit material available at CR, INB, JBL, L, UCH and USJ were studied. Phenological data were recorded in the field and from cultivated specimens. Herbarium specimens were deposited at CR, JBL, PMA, UCH and USJ. The map and georeferences for specimens were obtained using a Garmin eTrex Vista GPS and Google Earth 6.1.0 ©. Ecological zones were estimated by using the Holdridge Life Zone System (Holdridge, 1987) and the Mapa Ecológico de Costa Rica by Bolaños *et al.* (2005). Sketches of specimens were drawn with a Leica MZ 9.5 stereomicroscope with a drawing tube. Color illustrations were made using an Epson Perfection 4490 Photo Scanner, a Nikon D5100 digital camera and a DFC295 Leica digital microscope color camera with Leica FireCam version 3.4.1 software. The new species was illustrated and described from living specimens. Scanning electron microscope (SEM) micrographs were taken from flowers fixed in FAA (formalin, acetic acid, ethanol 50%). The samples were then dehydrated through a series of ethanol steps and subjected to critical-point-drying using liquid CO<sub>2</sub>. Dried samples were mounted and sputter-coated with gold and observed with a JEOL JSM-5300 scanning electron microscope at an accelerating voltage of 10kV.

## Phylogenetic analysis

Of the 35 sequences used here, 31 were downloaded from NCBI GenBank (Pridgeon *et al.* 2001, Chiron *et al.* 2012; Table 1). Plants were obtained from the living collections at JBL and their vouchers deposited in the spirit collections at JBL. Fresh leaf and flower cuttings of approximately 1 cm<sup>2</sup> were dried with silica gel. Samples (20 mg) were pulverized and extraction performed following the DNEasy procedure (Qiagen). The nuclear ribosomal internal transcribed spacer (nrITS) region was amplified using the methods and primers for sequencing and amplification described by Sun *et al.* (1994), and Sanger sequencing was done commercially by Macrogen on a 96-capillary 3730xl DNA Analyzer automated sequencer (Applied Biosystems, Inc.) using standard dye-terminator chemistry (Macrogen, Inc.).

The Staden *et al.* (2003) package was used for editing of the sequences. Contigs were exported as .fas files and opened in Mesquite v2.72 (Maddison & Maddison 2007), where they were checked for misalignments and adjusted manually. The ends of each data set were trimmed to eliminate possible erroneous data, and gaps were regarded as missing data. *Phloeophila peperomioides* AF275690 was used as outgroup, as it was found to be the most distantly related of all included species (Pridgeon *et al.* 2001). The trees were produced with an analysis of the nrITS dataset of 35 sequences using BEAST v1.6.0. (Drummond & Rambaut 2007). Parameters were set to preset, except for substitution model GTR with 8 categories, clock model uncorrelated lognormal, tree prior Yule process, and number of generations 20,000,000. The resulting trees were combined using TreeAnnotator v1.6.0., where the first 100 trees were used as burn-in. FigTree v1.3.1. (Rambaut 2009) was used to edit the resulting tree. Branch fading is correlated to posterior probabilities of those branches.

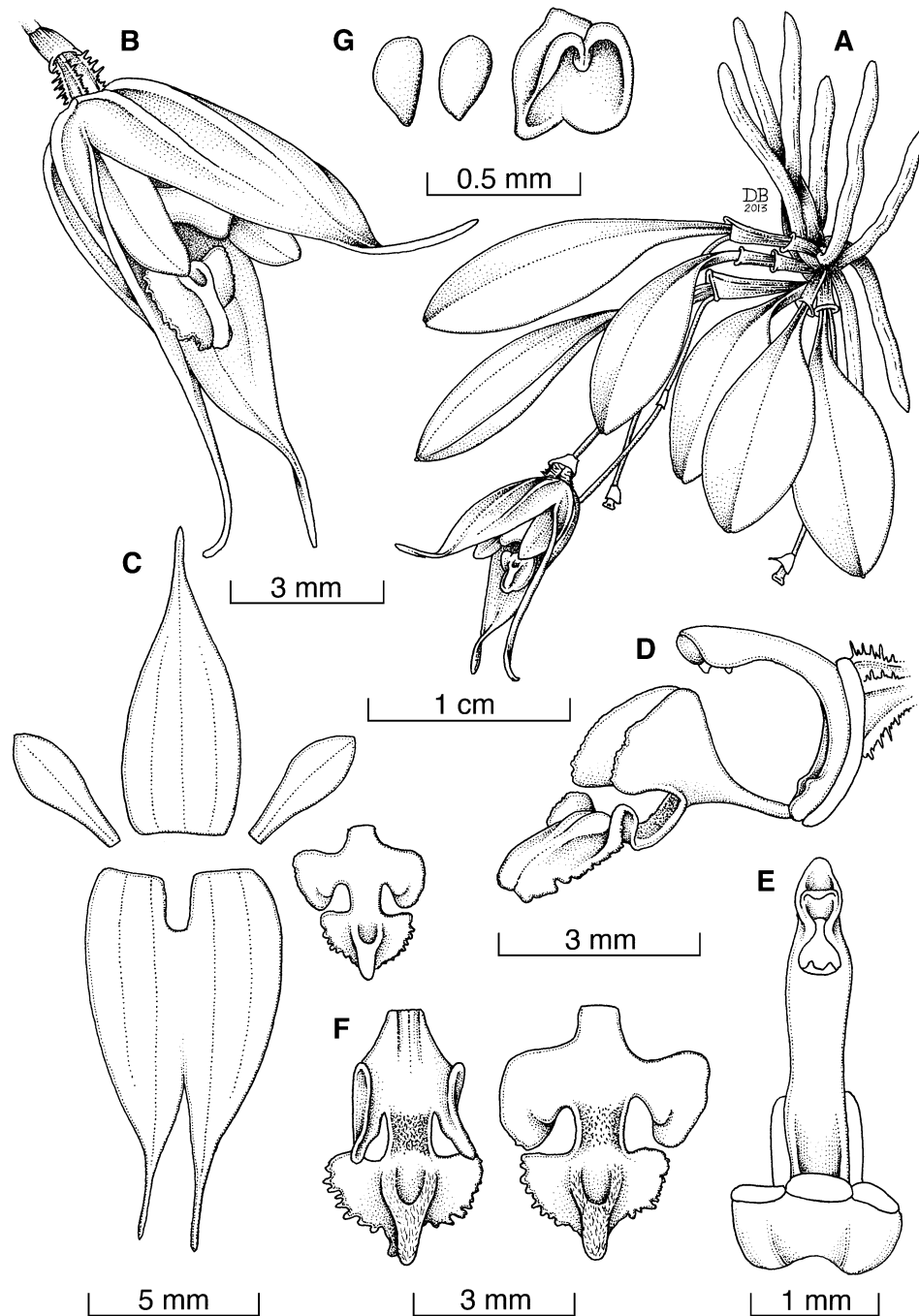
**TABLE 1.** List of the 35 taxa used in the phylogenetic analysis. The vouchers, NCBI GenBank accession number and source are given. Scientific names follow Pridgeon 2005.

Taxon	Voucher	Accession Number	Source
<i>Dryadella edwallii</i> (Cogn.) Luer	MWC305	AF262824	GenBank
<i>Dryadella hirtzii</i> Luer	BGH123364	EF079367	GenBank
<i>Dryadella kautskyi</i> (Pabst) Luer	CVDB1997	JQ306380	GenBank
<i>Dryadella simula</i> (Rchb.f.) Luer	MWC1095	AF262825	GenBank
<i>Dryadella susanae</i> (Pabst) Luer	GC11240	JQ306486	GenBank
<i>Phloeophila peperomioides</i> (Ames) Garay	None	AF275690	GenBank
<i>Platystele compacta</i> (Ames) Ames	MWC5637	AF262822	GenBank
<i>Platystele misera</i> (Lindl.) Garay	MWC5625	AF262823	GenBank
<i>Platystele stenostachya</i> (Rchb.f.) Garay	MWC5618	AF262821	GenBank
<i>Scaphosepalum gibberosum</i> (Rchb.f.) Rolfe	MWC968	AF262817	GenBank
<i>Scaphosepalum grande</i> Kraenzl.	MWC1107	AF262819	GenBank
<i>Scaphosepalum swertiifolium</i> (Rchb.f.) Rolfe	MWC1383	AF262818	GenBank
<i>Scaphosepalum ursinum</i> Luer	BGH124283	EF079365	GenBank
<i>Scaphosepalum verrucosum</i> (Rchb.f.) Pfitzer	MWC1331	AF262820	GenBank
<i>Specklinia absurda</i> Bogarín, Karremans & R.Rincón	DB9772 (JBL-Spirit)	KC425826	Karremans <i>et al.</i> (Unpubl.)
<i>Specklinia absurda</i> Bogarín, Karremans & R.Rincón	DB8711 (JBL-Spirit)	KC425827	Karremans <i>et al.</i> (Unpubl.)
<i>Specklinia brighamii</i> (S. Watson) Pridgeon & M.W.Chase	SOL761	AF262925	GenBank
<i>Specklinia condylata</i> (Luer) Pridgeon & M.W.Chase	MWC6808	AF262873	GenBank
<i>Specklinia costaricensis</i> (Rolfe) Pridgeon & M.W.Chase	MWC5612	AF262862	GenBank
<i>Specklinia costaricensis</i> (Rolfe) Pridgeon & M.W.Chase	MWC5636	AF262863	GenBank
<i>Specklinia fimbriata</i> (Ames & C.Schweinf.) Solano	SOL769	AF262924	GenBank
<i>Specklinia fuegi</i> (Rchb.f.) Luer	AK 5600 (JBL-Spirit)	KC425786	Karremans <i>et al.</i> (Unpubl.)
<i>Specklinia fulgens</i> (Rchb.f.) Pridgeon & M.W.Chase	MWC5630	AF262872	GenBank
<i>Specklinia grobyi</i> (Bateman ex Lindl.) F.Barros	GC09357	JQ306388	GenBank
<i>Specklinia grobyi</i> (Bateman ex Lindl.) F.Barros	MWC1093	AF262860	GenBank
<i>Specklinia grobyi</i> (Bateman ex Lindl.) F.Barros	GC04524	JQ306485	GenBank
<i>Specklinia lanceola</i> (Sw.) Lindl.	MWC1433	AF262861	GenBank
<i>Specklinia lanceola</i> (Sw.) Lindl.	AP s.n.	KC425838	Pridgeon & Chase 2002
<i>Specklinia mirifica</i> Pridgeon & M.W.Chase	MWC6800	AF262865	GenBank
<i>Specklinia montezumae</i> Luer (Luer)	AK229 (JBL-Spirit)	KC425811	Karremans <i>et al.</i> (Unpubl.)
<i>Specklinia picta</i> (Lindl.) Pridgeon & M.W.Chase	CVDB2146	JQ306384	GenBank
<i>Specklinia picta</i> (Lindl.) Pridgeon & M.W.Chase	GC06131	JQ306385	GenBank
<i>Specklinia remotiflora</i> Pupulin & Karremans	MWC1303	AF262859	GenBank
<i>Specklinia subpicta</i> (Schltr.) F.Barros	GC11046	JQ306389	GenBank
<i>Specklinia tribuloides</i> (Sw.) Pridgeon & M.W.Chase	MWC5615	AF262867	GenBank

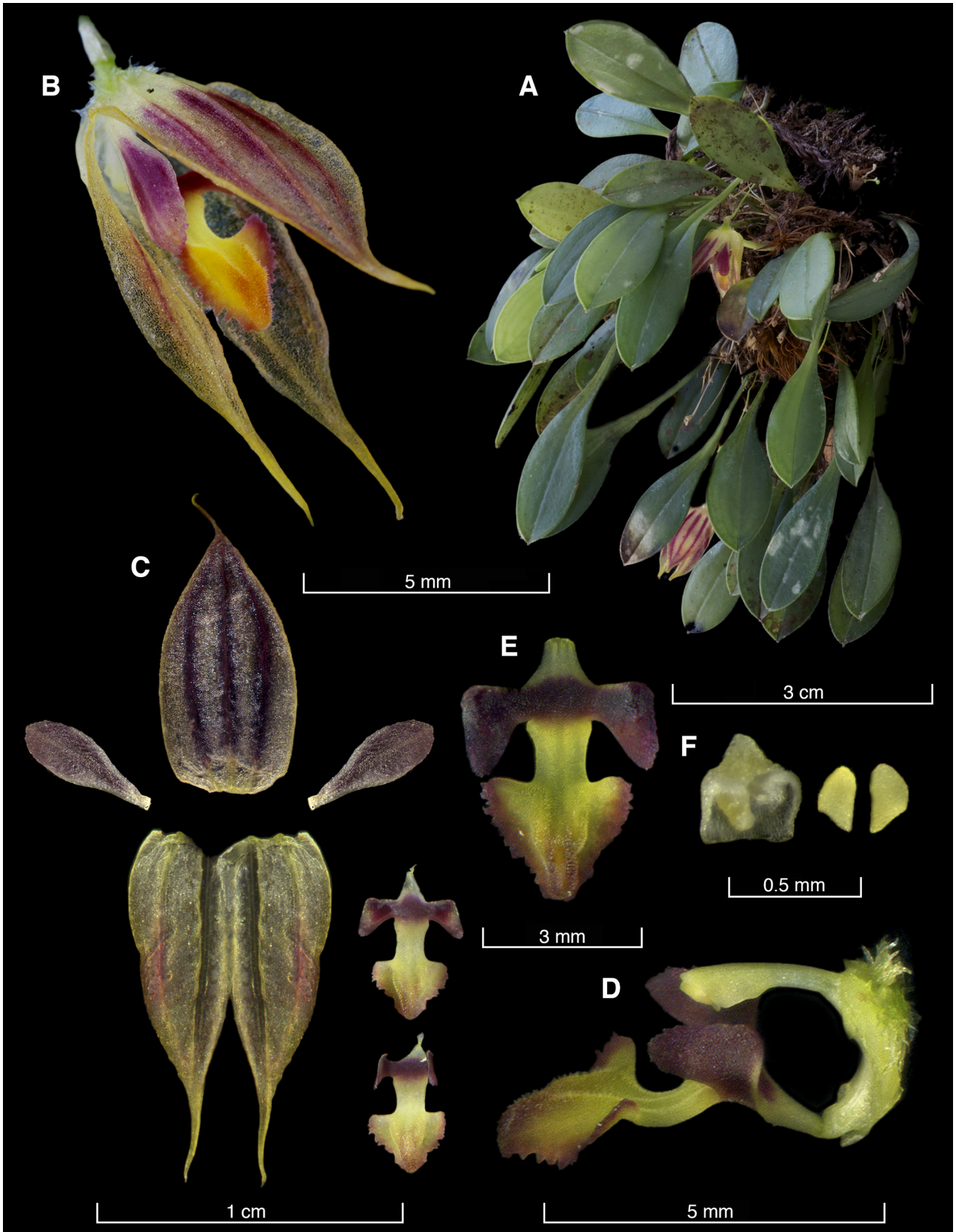
*Specklinia absurda* Bogarín, Karremans & R.Rincón, *spec. nov.* (Figs. 1–3).

The species is similar to *Specklinia fuegi* (Rchb.f.) Solano & Soto Arenas; however, it differs in the pendent plant, single-flowered inflorescence, whitish-yellowish sepals with red-pink veins and yellow apex, red petals with translucent margins and the pandurate-trilobed, unguiculate lip with a distinct papillose isthmus, and erect, reniform, erose lateral lobes, with a Y-shaped thickened, hirsute callus. It is also similar to *Specklinia cactantha* Pridgeon & M.W.Chase but differs in the erect, glabrous inflorescence, not spiculate sepals and pandurate-trilobed lip.

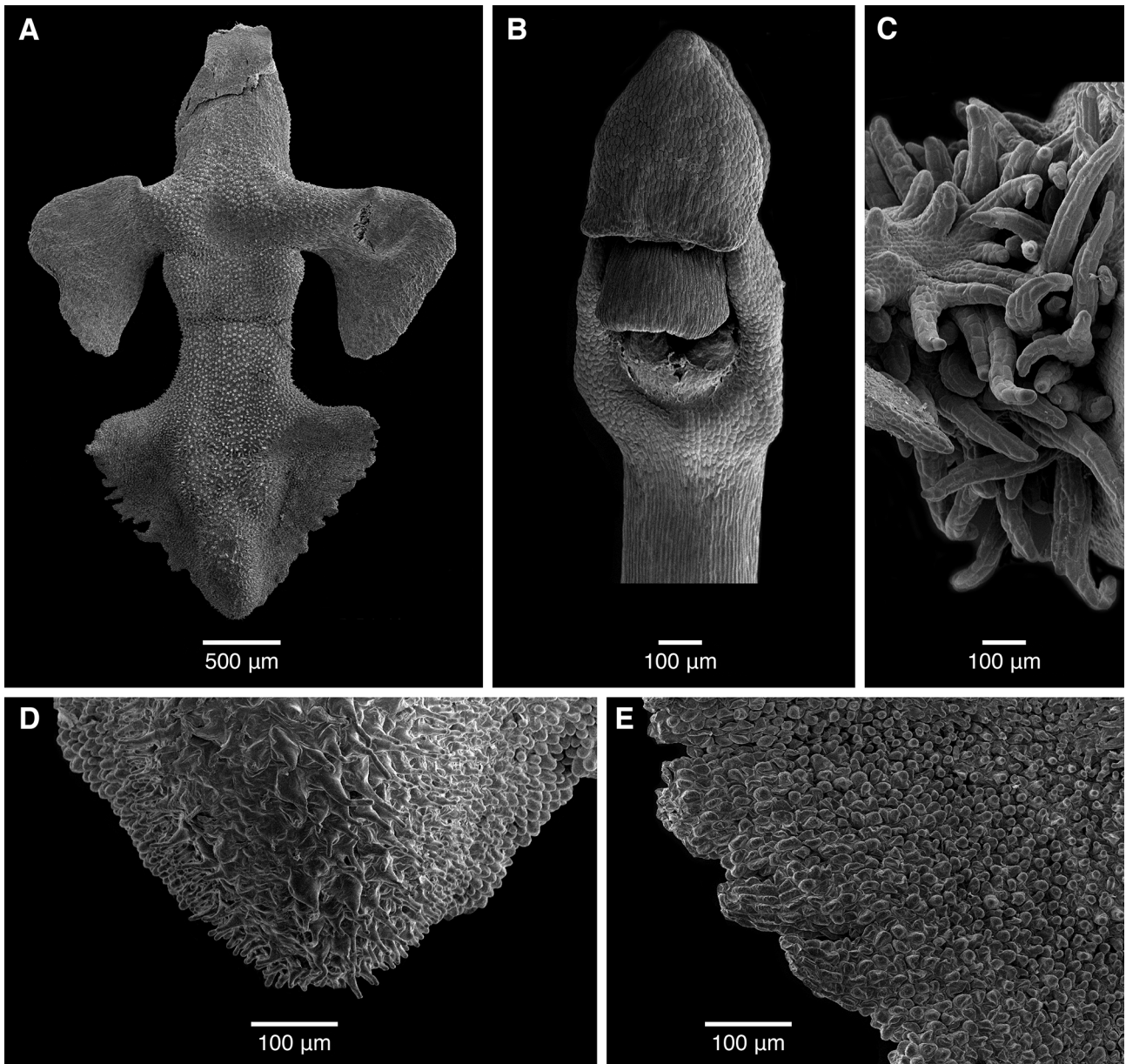
**Type:**—COSTA RICA-PANAMÁ. Puntarenas-Chiriquí: Coto Brus-Renacimiento, línea fronteriza hacia el Cerro Pando, después del mojón N.338, 8°55'11.22" N 82°43'18.18" W, 2446 m, bosque muy húmedo montano bajo, epífita en bosque primario, “*in sylvis virginis versus montium Pando in itinere ad summum Costa Rica austro-orientalis in finibus utrimque Costa Rica et Panama*”, 19 April 2011, Bogarín 8711, Jiménez & Karremans (holotype, CR!; isotypes, JBL!, PMA!, UCH!, USJ!).



**FIGURE 1.** *Specklinia absurda*. A. Habit. B. Flower. C. Dissected perianth. D. Column and lip, lateral view. E. Column, front view. F. Lip, natural position and spread. G. Pollinarium and anther cap. Drawn from the holotype by D. Bogarín.



**FIGURE 2.** Lankester Composite Dissection Plate (LCDP) of *Specklinia absurda*. A. Habit. B. Flower. C. Dissected perianth. D. Column and lip, lateral view. E. Lip, spread. F. Pollinarium and anther cap. Based on photographs of Bogarín *et al.* 9772 (JBL) by A.P. Karremans and D. Bogarín.



**FIGURE 3.** SEM images of micromorphology of *Specklinia absurda*. A. Lip, flattened. B. Column front view showing the anther cap, rostellum and stigma. C. Surface of the echinate ovary showing the cellular projections. D. Lip apex showing the epidermal cells of the apex of the callus. E. Basal lip lobe margin showing the shape of the papillate epidermal cells. Voucher specimen: *Bogarín et al. 9772* (JBL). By A.P. Karremans.

Epiphytic, caespitose herb, up to 2.5 cm long. Roots flexuous, to 1 mm in diameter. Ramicauls erect, up to 1 cm long, enclosed by 2 tubular sheaths up to 5 mm long. Leaves suberect, elliptic, obtuse, emarginate, with an apicule, lenticular,  $1.0\text{--}2.2 \times 0.5\text{--}0.8$  cm, cuneate at the base, narrowing into an indistinct petiole less than 3 mm long. Inflorescence racemose, single-flowered, pendent, glabrous, shorter or as long as the leaves, 1.0–1.5 cm long; peduncle, up to 1.1 cm long, rachis 1 mm long. Floral bracts ovate, acute, conduplicate, membranaceous, up to 1.0 mm long. Pedicels 8 mm long, persistent. Ovary to 1.5 mm long, carinate, echinate. Flowers with the sepals whitish-yellowish with red-purple veins, apex yellow, petals red with translucent margins, lip with the lateral lobes reddish, midlobe yellow with margin pinkish white and column whitish-greenish. Dorsal sepal ovate to elliptic, acuminate, entire, dorsally with three keels, concave,  $9.2 \times 3.5$  mm. Lateral sepals connate up to 4.5 mm into an ovate, entire, dorsally keeled lamina  $11.3 \times 5.7$  mm, the acuminate, filiform apices to 2.5 mm long. Petals spathulate-lanceolate, acute, entire,  $4.3 \times 1.6$  mm. Lip

unguiculate, pandurate-trilobed,  $4.8 \times 4.0$  mm, with a distinct isthmus below the midlobe, lateral lobes reniform, erose, erect in natural position,  $1.4 \times 1.8$  mm, isthmus quadrate, papillose,  $0.9 \times 0.9$  mm, midlobe triangular, puberulent, erose,  $2.8 \times 2.1$  mm, with a Y-shaped, thickened, hirsute callus from the middle towards the apex, attached to the column foot. Column cylindrical, footed, arcuate, entire apically, with a pair of minute calli at base, anther apical and stigma ventral. Pollinia two, ovoid, without caudicles or viscidium. Anther cap rounded, cucullate. (Fig. 3A–E)

**Distribution:**—Endemic to the Cordillera de Talamanca in southern Costa Rica and western Panama (Fig. 4).

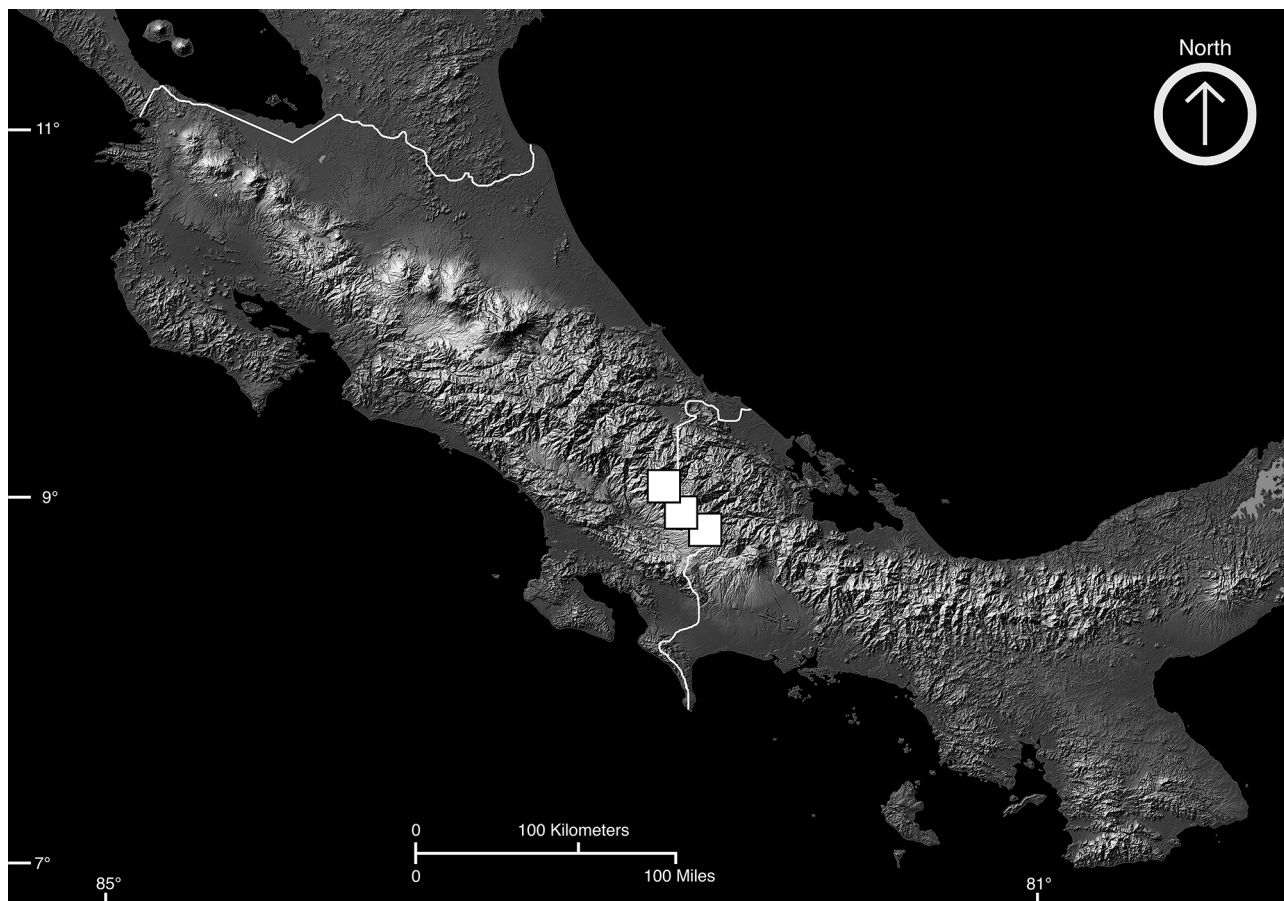


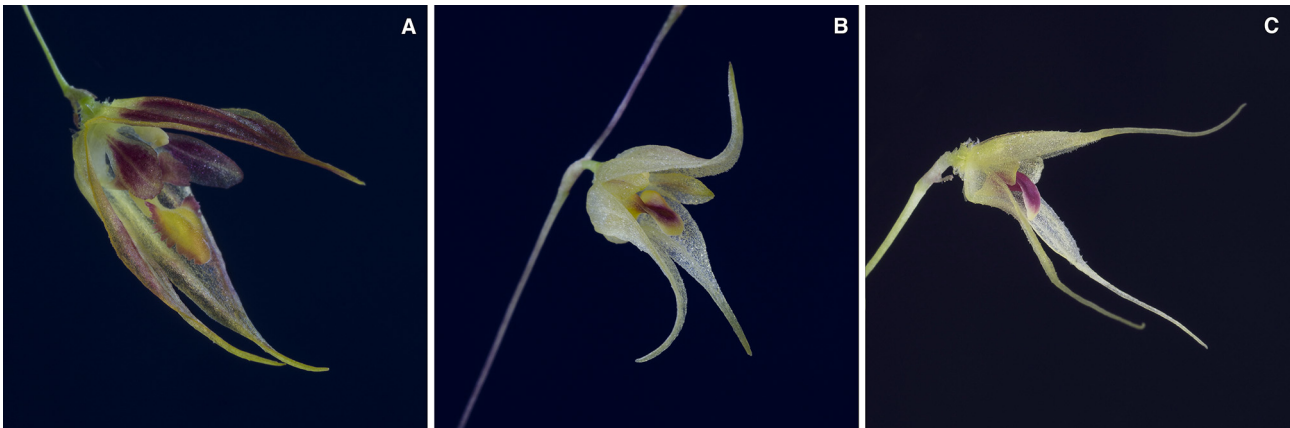
FIGURE 4. Distribution of *S. absurda* in Costa Rica and Panama, by D. Bogarín.

**Habitat and ecology:**—Epiphytes forming large colonies on main trunks in oak forest mostly in shaded spots in wet forest (Holdridge, 1987) at around 2400–2550 m elevation.

**Etymology:**—From the Latin *absurdum*, “absurd, illogical, out of tune, contrary to common sense” in reference to the flower morphology, especially the lip, which seems exceptional when compared to its closest relatives.

**Additional specimens examined (paratypes):**—COSTA RICA. Limón: Talamanca, Bratsi, Parque Internacional La Amistad, Valle del Silencio, orillas del Río Terbi cerca del andarivel,  $9^{\circ}06'41.81''$  N  $82^{\circ}57'42.44''$  W, 2462 m, bosque pluvial montano, 16 agosto 2012, *Bogarín 9864, Fernández, Godínez, Karremans, Kruizinga & Smith* (JBL-spirit). Límite entre Limón y Puntarenas: Talamanca-Buenos Aires, Bratsi-Potrero Grande, Parque Internacional La Amistad, Sector Altamira, sendero al Valle del Silencio, Cerro Hoffman, sobre la divisoria de aguas,  $9^{\circ}05'38.2''$  N  $82^{\circ}58'37.73''$  W, 2553 m, bosque pluvial montano, 14 agosto 2012, *Bogarín 9772, Fernández, Godínez, Karremans, Kruizinga & Smith* (JBL-spirit). (Fig. 5).

**Observations:**—This species is similar to *Specklinia fuegi* (Reichenbach; 1866: 97) Solano & Soto Arenas (2002: 10). It differs mainly in the pendent, single-flowered inflorescence (rather than erect, few-flowered), whitish-yellowish sepals with red-pink veins and yellow apex, red petals with translucent margins (rather than white-cream) and pandurate-trilobed, unguiculate lip with a distinct papillose isthmus below the anterior lobe, and reniform, erose lateral lobes, erect in natural position (Fig. 3A), with a Y-shaped thickened, hirsute, papillose apical callus (Fig. 3D, E; rather than a simple, smooth lip without an isthmus). *Specklinia absurda* is also similar to *Specklinia cactantha* (Luer; 1976: 72) Pridgeon & M.W.Chase (2001: 257) and *S. turrialbae* (Luer; 1991: 105) Luer (2004: 264). The main differences among the species related to *S. absurda* are summarized in Table 2.



**FIGURE 5.** Flower morphology: A. *S. absurda* (Bogarín 9772, JBL). B. *Specklinia fuegi* (Karremans 5600, JBL). C. *Specklinia turrialbae* (Karremans 5635, JBL). A-B by D. Bogarín. C by A.P. Karremans.

**Phylogenetic placement:**—Placing *S. absurda* among its closest relatives based on morphology proved to be a difficult task. The plant habit resembles species of the *S. grobyi* (Bateman ex Lindley; 1835: t. 1797) Barros (1983: 110) complex with elliptic-ovate or suborbicular thick leaves, whereas the pendent, single-flowered inflorescence and acuminate sepals resemble those of *S. fimbriata* (Ames & Schweinfurth; 1930: 18) Solano (2003: t. 671) and other species placed in *Muscarella*. However, *S. absurda* lacks the erect multi-flowered inflorescence, linear lip and glabrous ovary of the *S. grobyi* complex, and the loose raceme, denticulate, fringed or fimbriate petals, and pollinaria with caudicles, which characterize species of *Muscarella*. Superficially *Trichosalpinx webbiae* Luer & Escobar (1984) is also similar, sharing the elliptic, coriaceous thick leaves, acuminate, dorsally carinate sepals, obovate petals and a trilobed lip with the lateral lobes erect in natural position; however, that species has obscurely lepanthiform bracts (rather than tubular), prostrate leaves mottled with purple beneath (rather than erect, immaculate), erect inflorescences (rather than pendent), a glabrous ovary (rather than echinate) and a simple, trilobulate lip with entire margins (rather than a pandurate-trilobed, erose lip with a distinct papillose isthmus below the anterior lobe, and a Y-shaped thickened apical callus in *S. absurda*). Further morphological and molecular study of *T. webbiae* will be useful to confirm its phylogenetic affinities. An unpublished molecular phylogenetic analysis of *Specklinia* carried out by Karremans *et al.* indicates that *S. absurda* is related to some species placed in *Sylphia* by Luer (2006), all found embedded within *Specklinia*, sister to a clade that includes species of the *S. grobyi* complex and all the orange-flowered species of *Specklinia*, including the type of the genus, *Specklinia lanceola* (Sw.; 1788: 123) Lindl. (1830: pl. 8) (Fig. 6, Table 1). The new species is similar to *Specklinia cactantha*, *S. fuegi* and *S. turrialbae* in habit, ramicauls and petiolate leaves, inflorescence, echinate ovary (in the material we studied; Fig. 3C), acuminate sepals and rounded to apiculate, obovate petals, and column thickened towards the apex, and pollinaria without caudicles or viscidium. Nevertheless, the combination of unusual characters observed in the new species, especially the complex lip morphology (Fig. 3A), is not found in any of those species groups, and we have yet to find a species that we can say is sister to this species of *Specklinia*.



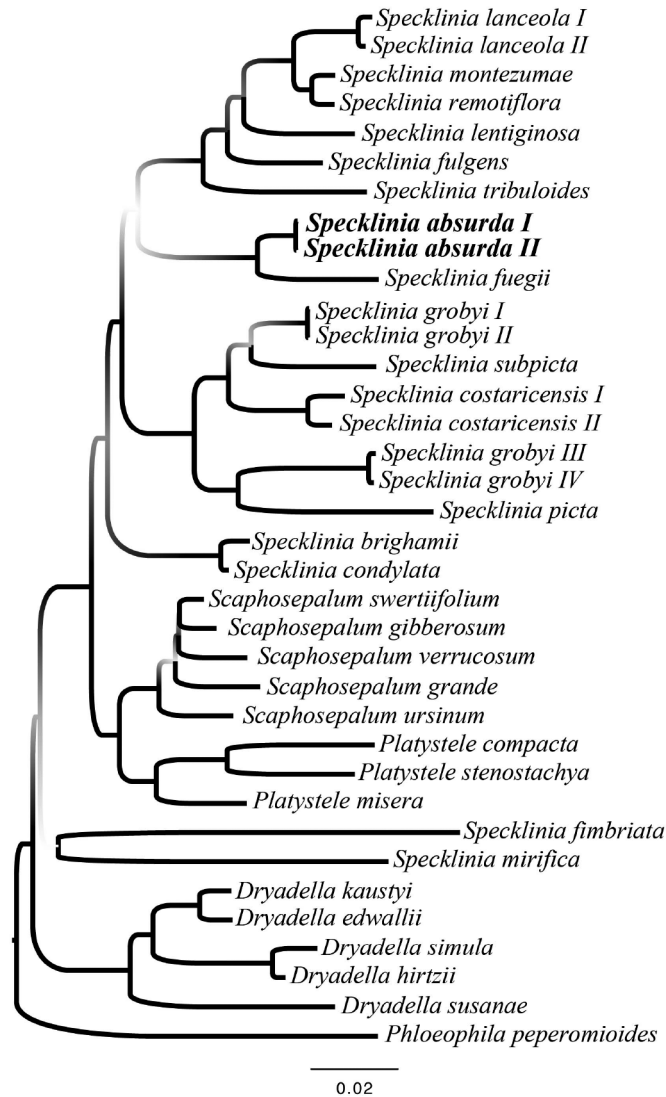


FIGURE 6. Phylogenetic placement of *S. absurda*. By A.P. Karremans using FigTree v.1.3.1.

TABLE 2. Comparison of the species of *Specklinia* related to *S. absurda*.

Character	<i>S. absurda</i>	<i>S. cactantha</i>	<i>S. fuegi</i>	<i>S. turrialbae</i>
<b>Inflorescence</b>	creeping or pendent, single-flowered, glabrous	erect, single-flowered, spiculate	erect, successively flowered, glabrous	erect, single-flowered, glabrous
<b>Sepals</b>	entire, acuminate, white suffused with purple	spiculate externally, long acuminate, white-rose	entire, acuminate, white-cream	entire, filiform, white
<b>Synsepal size</b>	11.3 × 5.7 mm	11.0 × 3.5 mm	7.5 × 3.0 mm	10.0 × 3.0 mm
<b>Petals</b>	acute, red-purple	obtuse or truncate-retuse, pale green with rose	obtuse, greenish-white	obtuse to acute, white-yellowish
<b>Lip</b>	pandurate-trilobed, with a distinct isthmus, erose	oblong-ovate, without isthmus, entire	subtrilobed, without isthmus, entire	subtrilobed or elliptic, without isthmus, entire
<b>Lip callus</b>	Y-shaped, thickened, pilose	a pair of low carinae, entire	a pair of marginal carinae, entire	a pair of marginal carinae, entire

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