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CONFUSION IN *EPIDENDRUM BRENESII* SCHLTR., AND A NEW COSTA RICAN SPECIES: *EPIDENDRUM SOTOANUM* (ORCHIDACEAE)

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ABSTRACT. Two species have been confused under the name *Epidendrum brenesii* Schltr., both were used in the original description and drawing of the type. The purple-flowered species, has been commonly known as *E. brenesii,* a specimen collected by Brenes close to the original *locus typicus* is therefore used to neotypify the species. The yellow-flowered species is described as *Epidendrum sotoanum* Karremans & Hágsater, in honor of the late Mexican botanist Miguel Ángel Soto Arenas.

KEY WORDS: *Epidendrum brenesii*, *Epidendrum sotoanum*, Costa Rica, Miguel Ángel Soto Arenas

A couple of years ago, while collecting above Muñeco, Cartago, Costa Rica, Diego Bogarín and his companions of the Lankester Botanical Gardens, collected a plant which resembled *Epidendrum brenesii* Schltr., because of its characteristic vertical growth habit, with successive lateral growths produced from the middle of the previous growth, and roots produced usually only from the base of the primary stem. After flowering, Karremans noted that it did not have the expected deep purple, velvety lip, but rather a larger, greenish yellow, glabrous lip, deeply cleft at the apex (Fig. 1).

Hágsater, upon seeing the images, immediately remembered a manuscript sent to him in 1983 by Kerry Barringer and Eric Christenson, proposing a yellow-flowered *Epidendrum* as new, but which he considered at the time to corresponded to *E. brenesii*. The matter slept for 16 years in a drawer.

Investigating the case further, all the material under *E. brenesii* was reevaluated to determine the presence of possible confused specimens. We have searched the AMO files, and found not only that Luis Sánchez, of AMO had also collected a specimen which later flowered in cultivation, but images of the original material pressed by Barringer and Christenson, and several Skutch and Standley specimens, corresponding to the eastern part of the range of what went for *E. brenesii*, were all marked as having yellow-brown flowers, and came from the upper basin of the Río Reventazón. More studied specimens collected further west all showed yellow-flowers as well.

It was obvious that a detailed re-evaluation of the original description and tracings of the type of *Epidendrum brenesii*, lodged at AMES, was necessary (The original type material was destroyed in Berlin during the war). It immediately became evident that both the illustration and the description are a composite of two different flowers. The illustration of the flower shows an entire flower with a relatively narrow, reniform, short-emarginate lip that corresponds to the purple-colored species. On the other hand, the floral segments present a very wide lip with a very wide sinus; the lines in the middle of

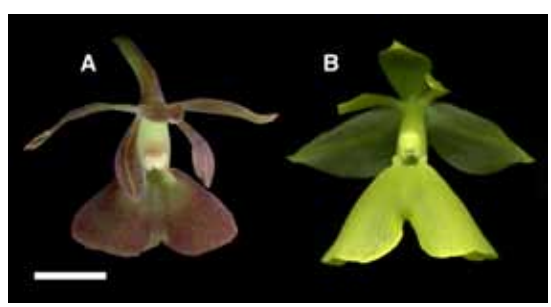

FIGURE 1. Comparison of the living flowers of, A – *Epidendrum brenesii* Schltr. (*Bogarín 1513*) and B – *Epidendrum sotoanum* Karremans & Hágsater (*Bogarín 3920*). Scale bar = 1 cm. Photo by F. Pupulin (A) and D. Bogarín (B).

FIGURE 2. Drawing of the holotype of *Epidendrum brenesii* (AMES), from *Brenes 118*. Courtesy of the Orchid Herbarium of Oakes Ames, Harvard University Herbaria.

the lip suggest a pair of keels running down the disc to the apex; features which correspond to the yellow-colored species. The drawing of the plant habit clearly illustrates the typical architecture of this group within *Epidendrum*, but is not useful to distinguish between the two entities (Fig. 2).

The original description indicates that the flowers are light green, tinged with violet, which is what has traditionally been called *E. brenesii*. However, the text indicates that the lip is widely reniform, nearly twice as wide as it is long (15 x 8 mm), that it is widely emarginate, and that the flowers are glabrous (Schltr. 1923). Those features correspond to the yellow-flowered species.

It is thus evident to us that Schlechter made a composite description and the unpublished illustration of the floral parts is also a composite. It could have happened when the floral parts were put together for the purpose of publishing the floral analysis; the view of one flower got mounted with the floral segments of another. Later, when Santiago & Hágsater (2006) published their revision of *E. brenesii* in Icones Orchidacearum, though the illustration was prepared from one single specimen of purple-colored flowers, they also prepared a composite description covering all the material then thought to belong to a single species, with either yellow or purple flowers.

Another distinguishing feature is the surface of the lip in the purple-colored species, which is clearly velutinous in fresh flowers, and can be seen under the microscope to be short-setose, densely covered by short, pointed trichomes. The yellow-flowered species has a glabrous appearance, the surface covered with low, rounded papillae.

Upon mapping all the collection localities, the purple-colored species appears to be endemic to the Cordillera Central, from the upper ridge south, while the yellow-colored species ranges along the Atlantic slope east as far as the upper basin of the Río Reventazón. Both species are present in the region of Varablanca.

After viewing all available evidence, we hereby propose to fix the type of the purple-flowered species with a neotype, using another specimen collected by Brenes near the type locality and located in the National Herbarium in San José, Costa Rica:

Epidendrum brenesii Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 209. 1923.

TYPE: COSTA RICA. Alajuela: San Pedro de San Ramón, 1050 m, November 1921, *A. M. Brenes 118*. Holotype: B (destroyed). Lectotype (designated by E. Santiago & E. Hágsater, *in* E. Hágsater & L. Sánchez S., Icon. Orch. (Mexico City) 8: pl. 814. 2006.): tracing of the type with floral details, mounted on *Standley 36573*, AMES 29339! (Cited by Barringer, 1986.), here rejected. Neotype (here designated): COSTA RICA: Alajuela: La Palma de San Ramón, 1250 m, 14 November 1922, *Brenes 449(154)***,** CR!

Epiphytic, monopodial, erect *herb***,** 30-70 cm tall. *Roots* basal from the initial stem and sometimes from an upper stem, 1.5-3 mm thick. *Stems* simple, cane-like, terete, straight, the new stem originating from a middle internode of the previous stem, gradually becoming thinner and shorter, 5-30 x 0.2-0.5 cm. *Leaves* 3-5, aggregate along the apical half of the stem, alternate, articulate, erect-spreading, unequal in size, the basal one generally smaller, sub-coriaceous; sheaths tubular, minutely striated, becoming fibrous with time, light green tinged with purple, 11-17 mm long; blade oblong, acute, margin entire, 2-8 x 1.3-2.5 cm. *Inflorescence* apical, flowering only once, racemose to rarely paniculate, arching, 2-4 cm long; peduncle thin, laterally compressed, straight, light green tinged purple, 1.0-1.5 cm long. *Floral bracts* about half as long as the ovary, triangular, acuminate, tinged purple, 4-5 mm long. *Flowers* 8-12[40], successive, though several may be open at one time, resupinate, light green with purple tinge to deep purple with the column green; slight "banana-peal" fragrance at sundown. *Ovary* terete, thin, not inflated, smooth, tinged purple, 8-13 mm long. *Sepals* partly spreading, free, obovate-elliptic, acute, slightly concave, glabrous, 3-veined, margin entire, spreading, dorsal sepal 12-13 x 6.0-6.5 mm, laterals oblique, 14.5-15.0 x 7.5 mm. *Petals* partly spreading, free, linear-oblanceolate, acute, 3-veined, margin entire, spreading, 12 x 2.5-3 mm. *Lip* united to the column, entire, reniform, slightly convex, velutinous, short setose, densely covered by short, pointed trichomes, emarginate, the apex sometimes slightly 4-lobed, margin entire, 8-12 x 15-19 mm; bicallose, the calli formed by a pair of short, laterally compressed thickenings; disc with a low, wide keel that reaches the apical sinus. *Column* thin at the base, gradually widened towards the apex, straight, 6.5 mm long; clinandrium-hood reduced, the margin erect, entire; rostellum apical, slit. *Anther* subreniforme, 4-celled. *Pollinia* 4, obovoid, laterally compressed, caudicles soft and granulose, as long as the pollinia. *Nectary* penetrating somewhat the ovary, smooth.

MATERIAL STUDIED: COSTA RICA. Alajuela: La Palma de San Ramón, 1250 m, 8 III 1930, *Brenes 11909a*, NY! Valverde Vega, Bajos del Toro, Hacienda Río Toro, Reserva Biológica Privada Bosque de Paz, 1500-2000 m, cult. XII 2007, *Karremans 2188*, JBL-Spirit! Digital image, AMO! JBL! Sarapiquí, 8 II 1966, *Lankester s.n. sub Rodriguez 366,* USJ! (Ilustration voucher). Heredia: Montaña Azul, entre Vara Blanca y Cariblanco, col. 19 III 1982, pressed cult. 23 I 1983, *Hágsater 6822,* AMO! Varablanca-Cariblanco, Montaña Azul, col. 19 III 1982, pressed cult. 22 II 1983, *Hágsater 6824*, AMO! (Illustration voucher, Fig. 3). Vara Blanca, 2 km noreste de Alto del Roble, faldas al norte del Cerro Chompipe, Refugio de Vida Silvestre Cerro Dantas, márgenes de la Quebrada Grande, 10°5'30.5"N 84°03'51.4"W, 1981 m, 14 IV 2005, *Bogarin 1513*, JBL-Spirit! Digital image, AMO! JBL! Vara blanca, cerca del cruce a San Miguel, 1000 m, 28 X 1995, *Morales 4966*, INB!

OTHER RECORDS: COSTA RICA. Alajuela: Valverde Vega, Bajos del Toro, *Karremans s.n.*, digital photo AMO! JBL! Sarapiquí, 11 II 1966, *Lankester s.n. sub Rodriguez 366*, xerox of illustration, AMO!

DISTRIBUTION AND ECOLOGY: Endemic to central Costa Rica, known only from the upper ridge of the Cordillera Central and south towards San Ramón, in humid premontane forest at 1000-2000 m altitude. Flowering from October to April.

We further propose the yellow-flowered species as new:

Epidendrum sotoanum Karremans & Hágsater, *sp. nov.*

TYPE: COSTA RICA: Cartago; Finca Kiri, camino a la Reserva Natural de Tapantí, 1300-1400 m, col. 25 IX 1996, pressed 12 VI 1998, *L. Sánchez 401, J. García Cruz, D.E. Mora & O. Rodríguez*. Holotype: USJ! Clonotype: Ibid. pressed 19 V 1997, AMO!

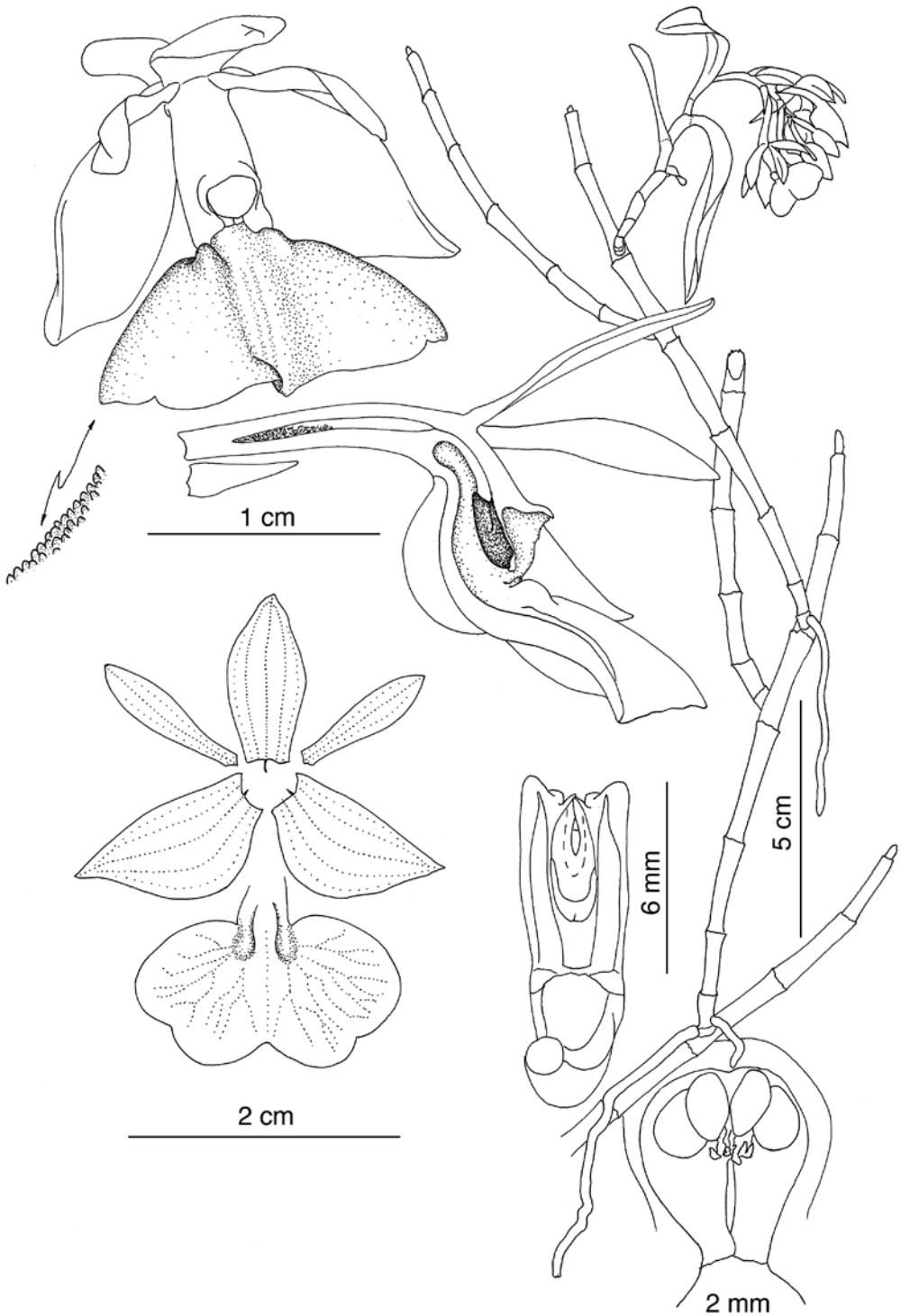

FIGURE 3. *Epidendrum brenesii* Schltr. A – Flower. B – Habit. C – Column and lip, lateral view. D – Dissected perianth. E – Column, ventral view. F – Pollinarium. Drawn by E. Hágsater from *Hágsater 6824* (AMO).

Species Epidendro brenesii Schltr. similis, floribus glabris flavis vel viridis plus minusve brunneo maculatis, labello latiore profunde et late emarginato recedit.

Plant epiphytic, monopodial, erect, branching, up to 50 cm tall. *Roots* basal, from the basal stem only, fleshy, filiform, thick. *Stems* terete, somewhat flexuous, each new stem produced from a subapical internode of the previous stem, below the leaves. *Leaves* few (3 in the holotype), aggregate towards the apex of the stem; sheath tubular, rugose; blades obovate-elliptic, obtuse, variable in size, the largest up to 5-10 x 1.3-2.5 cm. *Inflorescence* apical, flowering only once from each stem; peduncle laterally compressed and somewhat ancipitose, 2 cm long. *Floral bracts* half as long as the ovary, acute, 0.6-1 cm long. *Flowers* 4-15, greenish brown or yellow, column green, darker at the base. *Ovary* terete, smooth. *Sepals* partly spreading, obovate-elliptic, obtuse, 3-4-veined, margin entire, spreading; dorsal sepal 12-16 x 4.0-7.5 mm, lateral sepals oblique, 13-18 x 7-9 mm. *Petals* partly spreading, narrowly-obovate, obtuse, 3-veined, margin entire, spreading, 11-15 x 2-4 mm. *Lip* strongly bilobed, widely reniform, deeply emarginate, slightly convex in natural position, superficially glabrous in appearance but with low rounded papilla when observed under a microscope, 10-17 x 20-30 mm; lateral lobes obscurely bilobed, sub-orbicular, sometimes emarginate; margin entire; bicallose, the calli thickened at the base and ending in a pair of low keels. *Column* somewhat arching downwards, short, thickened towards the apex, sub-terete, 7-8 x 5 mm above the middle, with apical rounded wings; clinandrium-hood erect, very short, margin entire; rostellum near the apex of the column, slit. *Anther* obovate, 4-celled, 2.5 mm wide. *Pollinia* 4, obovoid, laterally compressed. *Nectary* short, without penetrating the ovary, smooth.

MATERIAL STUDIED: COSTA RICA. Cartago: Cartago, San Francisco, Muñeco, Finca Loma Verde y Jilguero, camino a Alto Belén, entre Sombrero y Quebrada Patarrá, 9°46'50.3"N 83°54'21.1"W, 1430-1620 m, bosque pluvial premontano, epífitas bosque secundario y árboles en zonas abiertas, 23 V 2007, *Bogarín 3919, M. Bonilla, R. Gómez, R. Trejos & J.D. Zúñiga*; JBL-Spirit! Digital image, AMO! JBL! (Illustration voucher, Fig. 4). Ibid. *Bogarín et al. 3920*, JBL-Spirit! Digital image, AMO! JBL! Orosi valley, in orchard along timber road above El Muñeco, along Rio Sombrero, 1500 m, 9°47'N, 83°11'W, 6 VI 1983, *Barringer & Christensen 4167*, F! Digital image and illustration, AMO! Heredia: San Rafael, Río Tibas, toma de agua de Concepción de San Rafael, 1700 m, 2 XII 1995, *Lépiz 160*, INB! Vara Blanca de Sarapiquí, between Poás and Barva volcanoes, 1770 m, II 1938, *Skutch 3510*, AMES! Ibid. 1950 m, II 1938, *Skutch 3526*, AMES! K! MO! Yerba Buena, NE of San Isidro, 2000 m, 22 II 1926, *Standley 49987*, AMES! US! Vara Blanca, 1400-1700 m, 27 VI 1978, *Todzia 332*, CR! **San José:** La Hondura, 1300-1700 m, 2 III 1924, *Standley 36573*, AMES! US!

OTHER RECORDS: COSTA RICA. Alajuela: San Pedro de San Ramón, 1050 m, XI 1921, *Brenes 118*,* B (destroyed), tracing of the floral details excluding the view of the whole flower; mounted on *Standley 36573*, AMES 29339! (Cited as type of *E. brenesii* by Barringer, 1986 and designated as lectotype of by Santiago & Hágsater, 2006). Cartago: Cartago, San Francisco, Muñeco, Finca Loma Verde y Jilguero, camino a Alto Belén, entre Sombrero y Quebrada Patarrá, 9°46'50.3"N 83°54'21.1"W, 1430-1620 m, bosque pluvial premontano, epífitas bosque secundario y árboles en zonas abiertas, 23 V 2007, *D. Bogarín 3819, M. Bonilla, R. Gómez, R. Trejos & J.D. Zúñiga,* Digital image, AMO! JBL!

DISTRIBUTION AND ECOLOGY: Endemic to Costa Rica, on the Cordillera Central, along the Atlantic slope, and east to the upper basin of the Río Reventazón. Epiphytic in secondary humid premontane forest, at 1500-2000 m elevation. Flowering in December-June.

Epidendrum sotoanum belongs to the Arbuscula Group, Incomptum Subgroup, which is characterized by the successive lateral growths produced from the middle of the previous growth, few leaves which aggregate towards the apex of the stems, a short apical inflorescence with fleshy greenish to violet-green flowers with short ovaries, the lip entire to 3-lobed. The

* The illustration and original description of *E. brenesii* represent a mixed collection, the floral segments belong to this entity, but the image of the entire flower to *E. brenesii*; the illustration of the plant habit is indistinguishable.

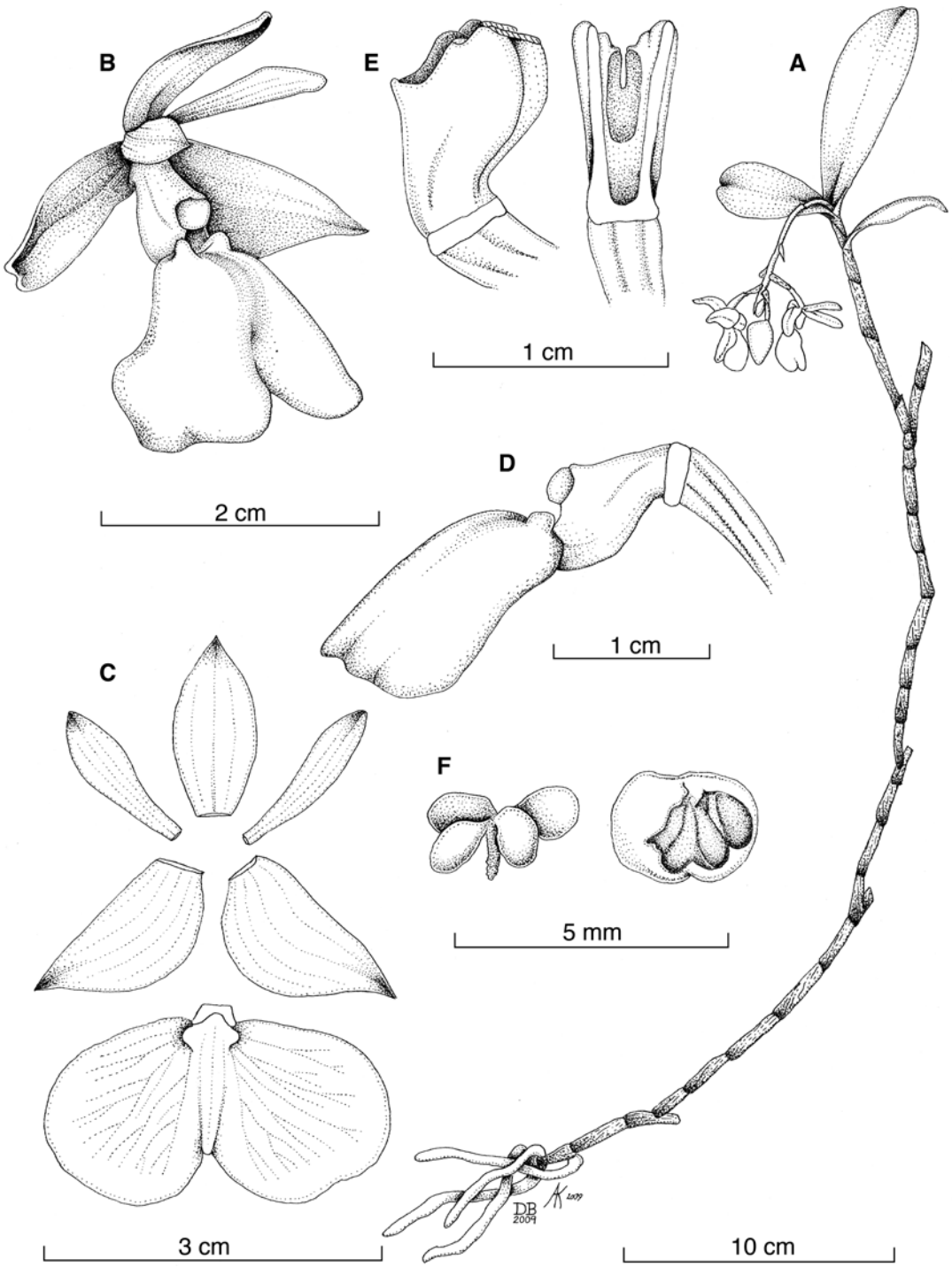

FIGURE 4. *Epidendrum sotoanum* Karremans & Hágsater. A – Habit. B – Flower. C – Dissected perianth. D – Column and lip, lateral view. E – Column, side and frontal views. F – Pollinarium and anther cap. Drawn by A. Karremans & D. Bogarín from *Bogarín 3919* (JBL-Spirit).

species is recognized by the large greenish yellow or greenish brown flowers, the glabrous (microscopically papillose), very large, deeply emarginate lip, and the apical rounded wings of the column. It is similar and has been confused with *Epidendrum brenesii* Schltr. which is known from upper ridge of the Cordillera Central and south towards San Ramón, its inflorescence has 8-12[40] violet-green flowers, a reniform, velutinous, short-emarginate lip, 15-19 mm wide. *Epidendrum bisulcatum* Ames, has shorter and narrower leaves, a smaller, sub-orbicular lip and linear petals. *Epidendrum incomptum* Rchh.f. which also occurs in Costa Rica can be distinguished by its 3-lobed, ecallose lip, the 3 lobes more or less triangular. Outside Costa Rica, only *Epidendrum foldatsii* Hágsater & Carnevali from Venezuela has the same architecture, and a bilobed lip, but the flowers are small, the lip being 4 x 7.5 mm.

We take pleasure in dedicating this species to our late fellow orchid researcher from Mexico, Miguel Ángel Soto Arenas, (1963-2009) who shared his knowledge and experience with us. Apart from his many contributions to science, reading through the narrative of the different ecosystems in *The Orchids of Mexico*, gives us a glimpse of how well he came to understand the relationship between orchids and their various habitats, as well as the threats to biodiversity.

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