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Epidendrum katarun-yariku (Orchidaceae), a new species of the *Schistochilum* group from the tepuis of the Guiana Highlands in South America

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Abstract

Epidendrum katarun-yariku is hereby described and illustrated as a new species of Orchidaceae native to the summits and upper slopes of the sandstone tabletop mountains (tepuis) in the Guiana Highlands in South America.

Keywords: Guiana Shield, *Secundum* subgroup, Venezuela, Brazil, Guayana, tepuy, Acopán-tepuí, Arekuna

Introduction

Epidendrum Linnaeus (1763: 952–954) represents one of the most numerous and diverse genera among the Neotropical orchids including terrestrial, epiphytic or lithophytic plants occurring in different types of habitats ranging from tropical forest, dunes and scrubs to the Andean páramos (Hágsater & Soto Arenas 2005, Chase *et al.* 2015). Its distribution extends from the southeastern United States (North Carolina) to northern Argentina (Hágsater & Soto 2005). The genus currently includes approximately 2400 species with over 1100 having been illustrated and described in the recent years, a notable majority in the series *Icones Orchidacearum* (Hágsater *et al.* 2016).

Until recently most authors have considered *Epidendrum secundum* Jacquin (1763: 224) as a variable species widely distributed in the Antilles and South America, with lilac, yellow, orange, red or white flowers, distinguished mainly by a complex callus and non-resupinate flowers (Schweinfurth 1959, Dunsterville & Garay 1961, Foldats 1970, Garay & Sweet 1974a) It should be noted that in 1974, in the same work, Garay and Sweet (1974b) changed the use of the name *E. secundum* for a completely different species: *E. anceps* Jacquin (1763: 224). Hágsater (1993) discussed the confusion and concluded that earlier authors were correct in applying the name *E. anceps* to the plant based on Jacquin's plate 138, and lectotypified *E. secundum* with Jacquin's plate 137. As such the name *E. secundum* applies only to a species with pink, non-resupinate flowers and a large complex callus.

Hágsater, who has travelled extensively throughout tropical America during the past 40 years, has proposed a number of new species and natural hybrids based on the understanding of the populations and their consistency. Pinheiro *et al.* (2010), studying the material from Brazil, mainly along the coast and in the Mata Atlântica, using both chromosomes and DNA, has demonstrated the existence of separate species but also evidence of extensive natural hybridization and backcrossing. Such is the case of *Epidendrum* × *pinheiroi* Hágsater (2020: pl. 1787), a hybrid between *E. puniceoluteum* Pinheiro & Barros (2006: 248) and *E. fulgens* Brongniart (1834: 196) found in the coastal regions of southern Brazil. Hágsater has also studied material from Martinique and, based on extensive recent photographic records, has proposed the existence of two parents, *E. secundum* and *E. cryptopateras* Hágsater & Courtinard (2019: pl. 1715) and their hybrid swarm which corresponds to *E. × elongatum* Jacquin (1789: 260) (Hágsater 2019), mistakenly described as from Caracas, Venezuela; the hybrid swarm is by far the most common entity found on Martinique. A similar situation is found in the Gran Sabana of Venezuela but will be described elsewhere. The situation atop the tepuis, from available recent photographic material, seems to involve discrete species, with no evidence of hybridizing at that altitude.

A thorough analysis of a living specimen found near the proposed *locus typicus* on Acopán-tepuí supplemented by a detailed revision of numerous herbarium specimens, as well as photographs of live material has brought us to a conclusion that the plant examined should be recognized as a discrete entity. We describe it as a new species and name it *E. katarun-yariku*, choosing a name derived from the indigenous Pemón Arekuna language to honor the priceless indigenous heritage of the Guiana Highlands region.

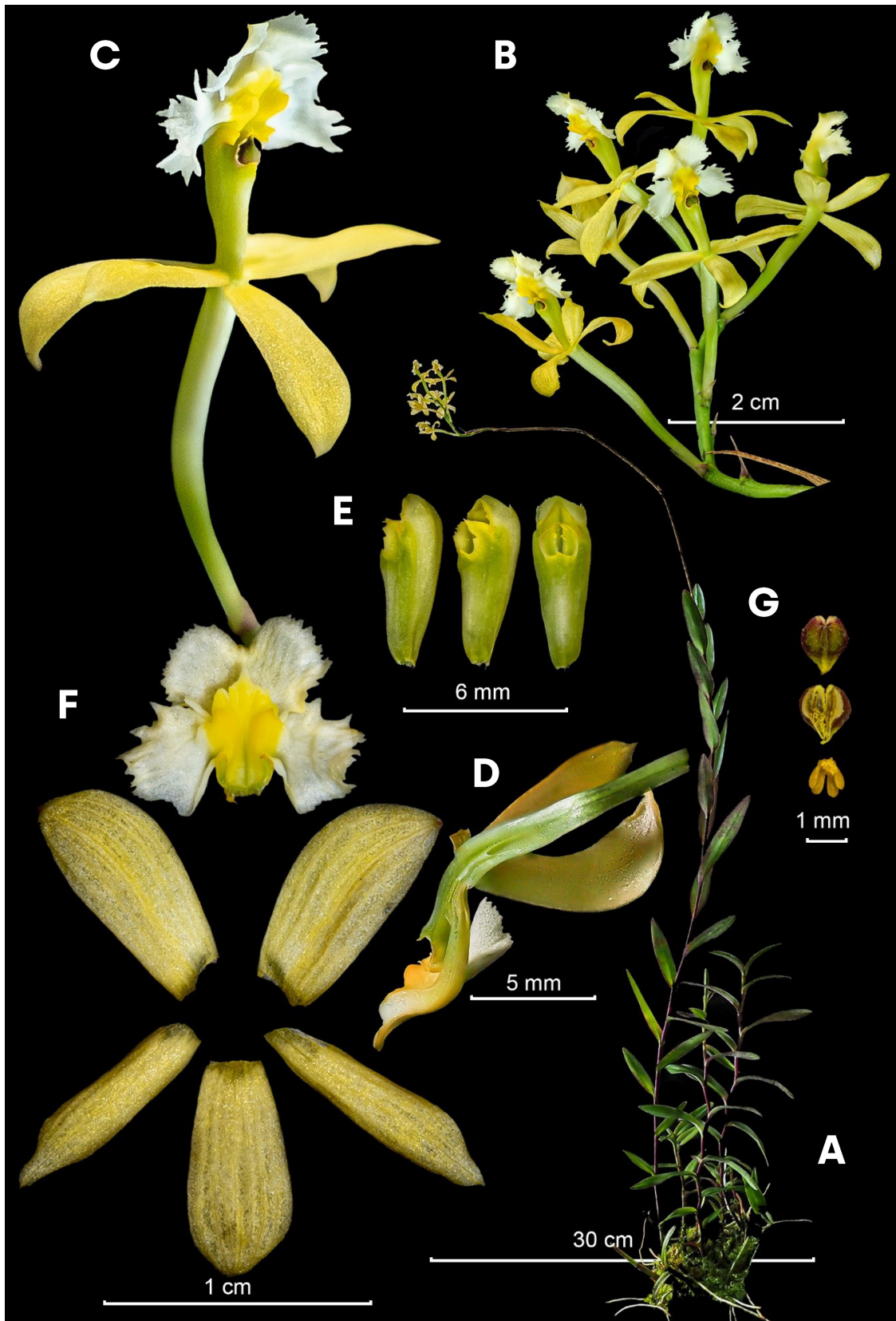


FIGURE 1. Plate of *Epidendrum katarun-yariku*. A. Habit. B. Inflorescence. C. Flower, frontal view. D. Flower, longitudinal section. E. Column. F. Dissected perianth. G. Anther and pollinia. Photographs by Mateusz Wrazidlo. Edited by Anaís Cisneros.

Materials and methods

Morphological analysis was carried out using a flowering specimen found on Acopán-tepuí. The specimen was later used to prepare a detailed Lankester composite dissection plate (LCDP) voucher (Fig. 1) using a digital camera equipped with a macro lens (Olympus OM-D E-M1 + M.Zuiko Digital 60mm f2.8). A revision of herbarium specimens from numerous different collectors, years and countries, mostly from Venezuela, was done. The specimens mostly shelved under *E. secundum*, are deposited in herbaria including RB, VEN, NY, MO, and AMES (Thiers 2016). Re flora, the virtual database of Brazilian collections was consulted, with one misidentified specimen recorded. A search was also made in the database AMO-DATA (Hágsater & Sánchez, 2003) which includes digital images of specimens at HB, INPA, MG, RB, SP and numerous herbaria in America and Europe, which have been photographed by Hágsater and co-workers in the past 40 years. Types and protologues of the species mentioned in the Discussion were seen.

Experiences from fieldwork carried out in Venezuela, Brazil & Guyana between 2017–2019 by the second author, Mateusz Wrazidlo (including an expedition to Acopán-tepuí, where the holotype of *E. katarun-yariku* was collected in 1984) as well as helicopter expeditions in Venezuela done by Brad Wilson were discussed regarding the assessment of the natural habitat and distribution of the new species. The first author, Eric Hágsater, visited the Brazilian section of Mt. Roraima and Mt. Tepequem in February 2017 with Leonardo P. Felix from the Universidad Federal de Paraíba and his team. A distribution map was prepared using QGIS (Fig. 3) (QGIS Development Team 2020)

Taxonomy

Epidendrum katarun-yariku Hágsater & Wrazidlo, *sp. nov.* (Figs. 1 & 2)

Type:—VENEZUELA. Bolívar, Gran Sabana, Macizo del Chimantá, sector SSE, Altiplanicie suroriental del Acopán-tepuí, cabeceras del Río Arauac, 1920 m, 14 February 1984, *J. A. Steyermark, J. L. Luteyn & O. Huber 129987* (holotype VEN!; isotype MO!).

Epidendrum katarun-yariku is similar to *E. secundum* Jacq. but the sepals and petals yellow, the lip white, callus massive, deep yellow (vs. flowers entirely pink with a massive callus, pale yellow at the base center, the apical 2/3 white).

Lithophytic or terrestrial, sympodial, caespitose herb, 23–300 cm tall including the inflorescence. **Roots** 1–2 mm in diameter, basal, terete, fleshy, thin, white. **Stems** 6–48 x 0.3–0.5 cm, simple, cane-like, slightly sinuous, terete to slightly compressed towards the apex, thin, covered by foliar sheaths. **Leaves** 6–24, distichous, distributed throughout the stem; sheaths 0.8–2.8 x 0.3–0.5 cm long, tubular, smooth, green tinged wine red, papyraceous and scarious when dry; blades 3.2–8.0 [10.5] x 0.7–2.0 [2.6] cm, narrowly elliptic-lanceolate to ovate-oblong, articulate, apex obtuse to rounded, narrowly bilobed, coriaceous, smooth green, margins entire, spreading. **Spathe** lacking. **Inflorescence** 19–75 cm long, racemose becoming pluri-racemose, producing new racemes over time from the upper nodes of the peduncle; peduncle 17–70 cm long, elongate, green, covered by several tubular bracts 5.9–6.9 cm long, yellow with brown dots, scarious when dry, striated, papyraceous, imbricated, acute; rachis 2.0–8.5 cm long. **Floral bracts** 4–7 x 2.0–2.5 mm, progressively smaller, much shorter than the ovary, triangular, acuminate. **Flowers** up to 17 or more, successive, with up to 6 open at any time, non-resupinate, sepals and petals yellow, lip white to pale yellow, callus yellow, column pale green, anther green tinged brown along the sides, becoming totally brown with age; fragrance none. **Ovary** 16–20 mm long, terete, thin, not inflated, pale green, darker towards the base, furrowed. **Sepals** 8.3–9.1 x 3.3 mm, spreading, the apical half becoming somewhat revolute as the flower ages, oblong-obovate, the outer margin nearly straight, apex obtuse, slightly apiculate, 7-veined, margin entire, spreading; lateral sepals oblique. **Petals** 9.1–10.0 x 2.5 mm, spreading, the apical half becoming somewhat revolute as the flower ages, oblanceolate, acute, 5-veined, margin entire, somewhat revolute. **Lip** 7.3 x 9.6 mm, united to the column, more or less flat in natural position, deeply 3-lobed, base deeply cordate; callus massive, fleshy, thick, with a total of 7 tubercles, the platformed formed by 5 unequal tubercles merged at the base, the central body formed by 3 tubercles, the middle part longer and prolonged into a low, short mid-ridge with a pair of lateral shorter tubercles, one on each side of the main body, slightly divergent, and basally two more tubercles, short, elevated, somewhat laminar, obliquely triangular, the apex rounded and then somewhat concave below, so as to be nose-shaped, placed atop the base of the lateral tubercles of the main body; lateral lobes 3.2 x 4.3 mm, the distal lateral margin superposed over the edge of the mid-lobe, sub-orbicular, lateral margins erose, distal margin irregularly erose-dentate; mid-lobe 3.7 x 6.3 mm, bilobed, the lobes sub-orbicular, apical sinus somewhat mucronate, margin irregularly erose dentate. **Column** 6.3 mm long, straight, terete, slightly thickened

towards the apex, with a pair of fleshy, yellow lateral lobes, recurved in front of the column, the apex rounded to truncate, margin entire. *Clinandrium hood* reduced, narrow, margin irregularly dentate. *Anther* cordiform, apex acute, laminar, surface rugose, 4-celled. *Pollinia* 4, narrowly obovate, elongate, laterally compressed; caudicles longer than the pollinia, soft and granulose, like a pile of roof-tiles; viscidium semi-liquid. *Rostellum* apical, slit. *Lateral lobes of the stigma* occupying 1/4 of the length of the stigmatic cavity. *Nectary* deep, penetrating half the pedicellate ovary. *Capsule* ellipsoid, 38 mm long (immature), pedicel 6 mm long, body 20 mm long, apical neck 12 mm long.

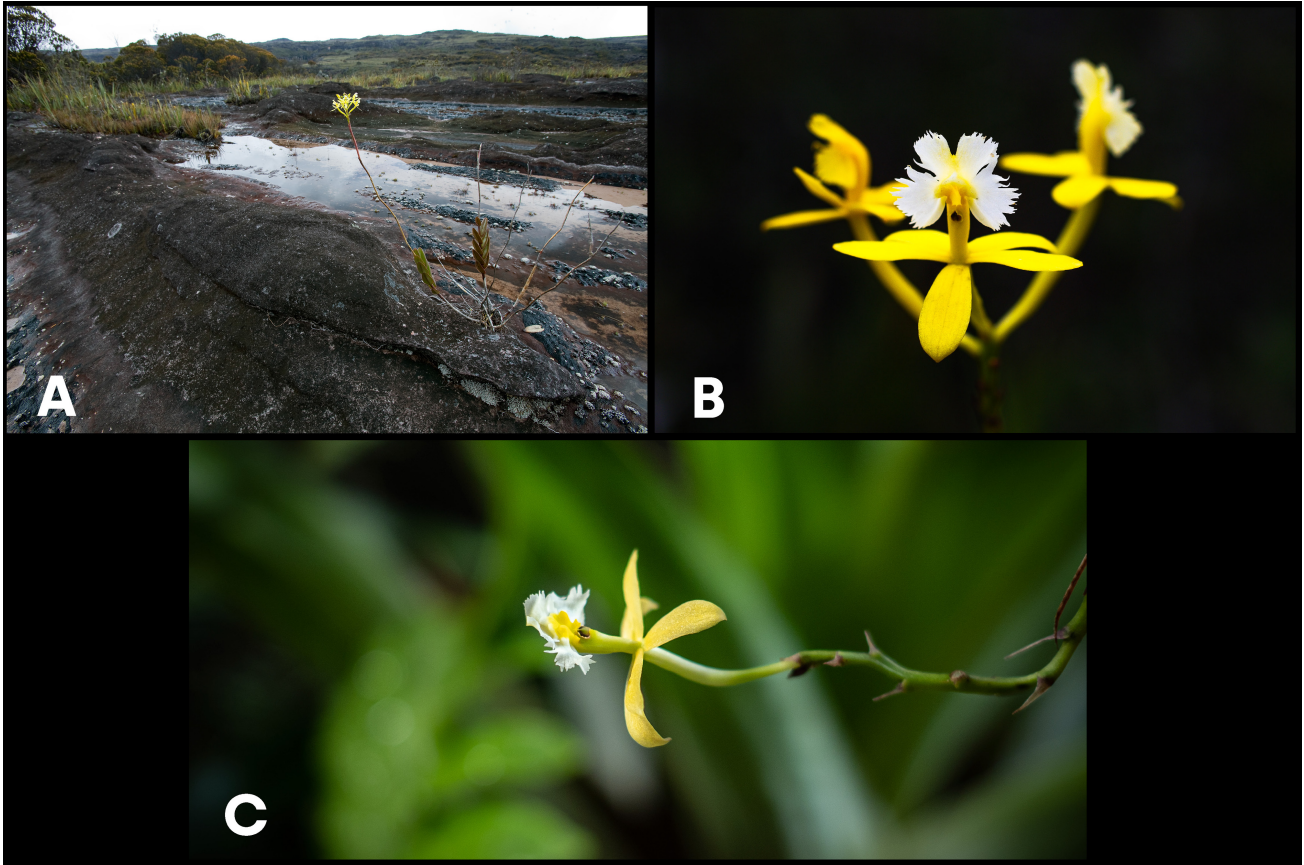


FIGURE 2. *Epidendrum katarun-yariku*. A. Plant in its natural habitat on Abacapá-tepuí, Chimantá Massif, Venezuela (photographed by Brad Wilson). B. Inflorescence photographed on a wild plant on Amurí-tepuí, Chimantá Massif, Venezuela (photographed by Martin Hingst). C. Flower on a specimen from Acopán-tepuí (photographed by Mateusz Wrazidlo).

Etymology:—From the indigenous Pemón Arekuna language, *katarun* (high), and *yariku* (flower), meaning high flower, in reference to this species being found only on the summits and upper foothills of the tepuis. The name was chosen in consultation with members of the Pemón Arekuna community of Paruima, to honor the indigenous heritage of the Guiana Highlands.

Distribution and habitat:—Known currently from the “high-tepui belt”, especially summit plateaus and upper talus slopes of the tepuis in the southwestern part of the states of Bolívar and Amazonas, Venezuela: Chimantá Massif (Acopán-tepuí, Amurí-tepuí, Apacará-tepuí, Abacapá-tepuí), Auyán-tepuí, Ptari-tepuí, Camarcaibarai-tepuí, Meseta del Jaua, Sierra de la Neblina and Cerro Duida (Fig. 3) as well as the neighboring area around Pico da Neblina in Brazil. Terrestrial in wet savanna; “praderas húmedas y arbustales enanos sobre turberas, bosquecillos ribereños y vegetación sobre rocas abiertas”, at 1380 to 2400 m altitude, with the lowest occurrences recorded on Cerro Sarisariñama. Flowering throughout the year. From records in Re flora and AMO-DATA, it does not appear to be present in Serra do Aracá in Brazil. The plates by Barbosa-Silva & Forzza (2016: fig. 73) only show a white flowered species of this group. None of the specimens mentioned in the Appendix 1 of Barbosa-Silva *et al.* (2020, Appendix 1), correspond to this entity.

Proposed conservation status:—VU (Vulnerable). Assuming that as stated by Steyermark (1979) only 63% of the Pantepui flora is endemic above 1500 m. Research shows that 80% of the vascular flora of the tepuis, ca. 1,700 species of which up to 400 are believed to be Pantepui endemics, are threatened of extinction (Nogué *et al.* 2009). *Epidendrum katarun-yariku* is only present in the “high tepui belt” as expressed by Huber (1988). Its present extension

area is confined to less than 20,000 km². It complies with Criterion B1 for the VU (Vulnerable) applies (IUCN 2001). It is threatened by the effects of climate change, increased temperatures and less rainfall, and is unable to migrate to higher altitudes.

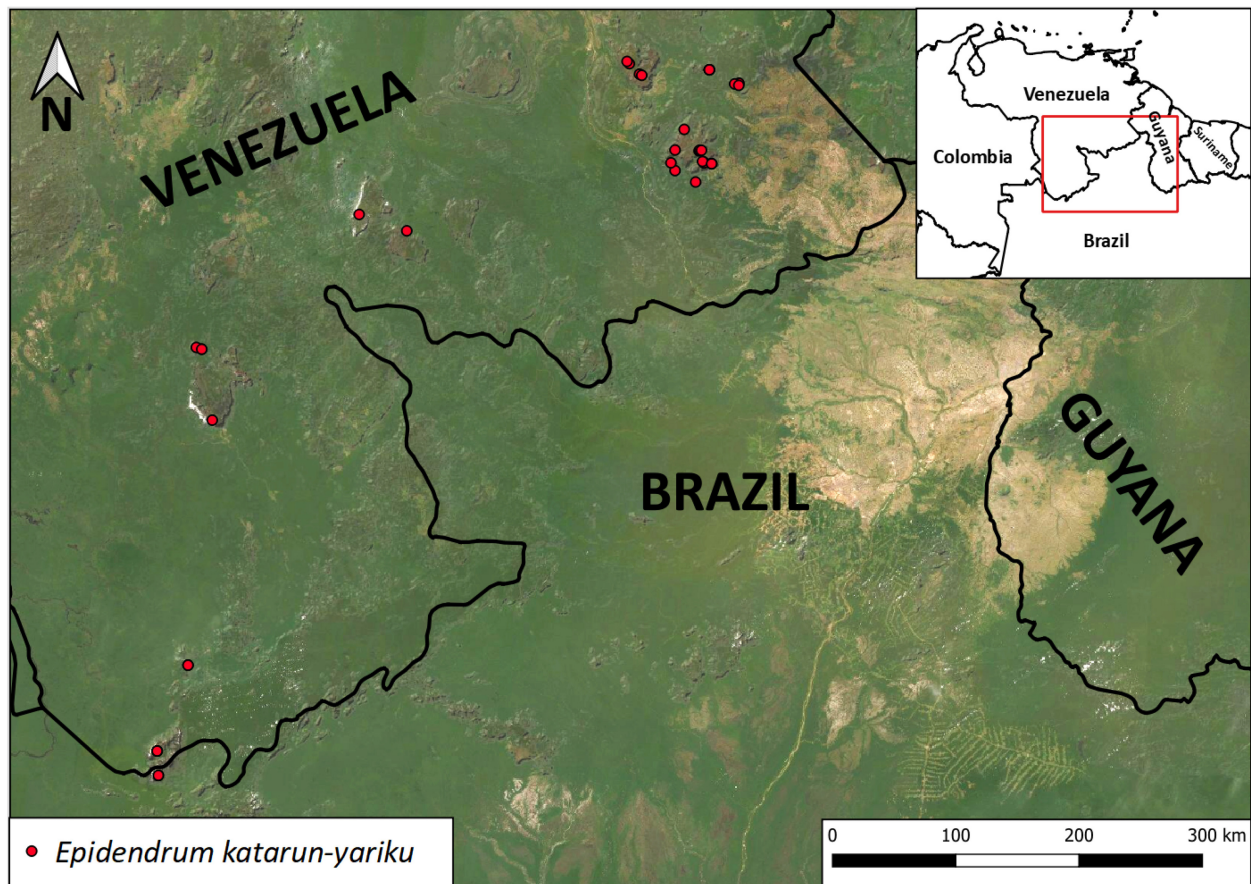


FIGURE 3. Distribution map of *Epidendrum katarun-yariku* in Venezuela and Brazil. (map by Mateusz Wrazidlo).

Discussion:—*Epidendrum katarun-yariku* belongs to the *Schistochilum* group, *Secundum* subgroup, which is recognized by the caespitose habit, simple stems, leaves oblong-lanceolate, coriaceous, bilobed, the peduncle elongate, erect, the inflorescence pluri-racemose, the flowers non-resupinate, and the callus complex, pluri-tuberculate. The species is recognized by yellow flowers with the lip white. *Epidendrum holstii* Hágsater (Hágsater & Carnevali 2018: pl. 1623) (Hágsater & Duarte 2020) has crimson red to salmon or coral-red sepals and petals and the lip pink to purple, a massive callus, yellow with edges white, the flowers relatively small, and the sepals 8–13 mm long. *Epidendrum secundum* Jacq. has pink flowers with a massive white callus with the base yellow; it is found commonly atop several tepuis, as well as on the base foothills of the tepuis and the surrounding savannas (La Gran Sabana). There are on the tepuis, in addition, a totally yellow flowered species, concolor, as well as a totally white entity, and an orange-red species with a large yellow callus; all of which require further study with detailed photographic records. *Epidendrum xanthinum* Lindley (1844: 18) has totally yellow flowers and is restricted to the states of Bahia, Minas Gerais, Rio de Janeiro and Sao Paulo in Amazon rainforest, Caatinga and Atlantic rainforest; it is endemic to Brazil, though the name has been used for all the yellow flowered members of this group throughout South America. In Colombia *E. melinanthum* Schlechter (1920: 139) (Moreno & Hágsater, 2017) and *E. aura-usecheae* Hágsater, Rincón-Useche & Pérez-Escobar (2013: 1410) are also totally yellow and distinct, easy to distinguish once you know what to look for, even in herbarium specimens. *Epidendrum sterrophyllum* Schlechter (1920: 151) also from Colombia (Antioquia), is certainly conspecific with *E. melinanthum*, as can be clearly seen from the sketch of a flower published by Schlechter (1929) and conforms to the known range of distribution of the latter.

Comments:—The specimens included have been seen, but as the dried flowers are very similar for the three species mentioned above, they have been identified based on the yellow and white color noted by the collectors, as that is definitely the most notable distinguishing feature, aside from differences in the calli which would require boiling a good pressed flower to regain the original three dimensional structure. From photographs provided by Martin Hingst

and Brad Wilson, it is clear that there is an additional species with completely yellow flowers, another with white flowers with a yellow callus, as well as orange flowers with a yellow callus atop Auyán-tepuí and also on the Chimantá Massif. Additional photographs provided by Mateusz Wrazidlo, taken in the vicinities of Kavanayén in Venezuela, proves that a similar species characterized by completely white flowers with a yellow callus occurs also on lower elevations in La Gran Sabana. Due to parts of the known distribution of *E. katarun-yariku* being located relatively close to the border of Guyana, it is highly probable that the range extends to the Pantepui biogeographic zones in that country (montane habitats of Waukauyengtipu in Guyana), which requires further study.

OTHER SPECIMENS EXAMINED: BRAZIL: Amazonas: Santa Isabel do Rio Negro, Igarapé Cuiabixi, P.N. do Pico da Neblina, 2060 m, 20 September 2012, *Forzza 7189* (RB!). **VENEZUELA:** Amazonas: Rio Negro, Neblina Camp 10; 12.5 km NNW of Pico Phelps, 16.25 km NE of Base Camp, 1670–1690 m, 12 February 1985, *Boom 5758* (VEN!) *ibid.* 13 February 1985, *Boom 5849* (NY!; VEN!); Atabapo: Cerro Duida, Campamento 3, 2140 m, 21 November 1991, *Fuentes 1263* (VEN!); Atabapo: Plateau of Cerro Huachamacari, 1720 m, 1 March 1985, *Liesner 18122* (MO!; VEN!); Rio Negro: Cerro Aracamuni, summit, Proa camp, 1400 m, 25 October 1987, *Liesner 22453* (MO!; VEN!); Cerro Huachamacari, Río Cunucunuma. In low bush in cumbre west of Caño de Dios, 1800 m, 14 December 1950, *Maguire 30238* (NY!); Bolívar: Macizo del Chimantá, sector sur-occidental. Cumbre meridional del Amurí-tepuí; altiplanicies levemente inclinadas hacia el sur y sureste, en las cabeceras del Río Aparurén, 2100 m, 4 March 1986, *Huber 11425* (VEN!); Macizo del Chimantá, sector occidental. Brazo sur del Apacará-tepuí, cerca de la conexión con el Abacapá-tepuí, en las cabeceras occidentales del Río Tirica, 2100 m, 8 March 1986, *Huber 11470* (VEN!); Central and western part of saddle between Camarcaibarai-tepuí and Tereké-Yurén-tepuí, 1800–1900 m, 23 May 1986, *Liesner 21005* (VEN!); Ptari-tepuí. Vicinity of Cave Rock camp below southern face of mountain, 1600–2000 m, 14 August 1970, *Moore 9753* (UC!; VEN!); Chimantá Massif. central section. Rocky edge of scarpment above Middle Falls Río Tirica below summit, 1925 m, 5 February 1955, *Steyermark 496* (AMES!; VEN x2!); Auyán-tepuí, Cumbre de la parte norte de la sección sur (división occidental del cerro): a lo largo del río Churum, vecindad del campamento sur, sureste del “Second Wall”, Bordering zanjonés, 1690 m, 3 May 1964, *Steyermark 93266* (AMES!; VEN!); Meseta del Jaua: Cerro Sarisariñama, cumbre, porción NE, 1380 m, 11 February 1974, *Steyermark 108970* (VEN!); Meseta del Jaua: Cerro Jaua: cumbre, porción SW; al W del tributario del Río Marajano 2–3 km al oeste del campamento y bordeando la sabana, 1850–1920 m, 4 March 1974, *Steyermark 109802* (VEN!); Macizo del Chimantá. Altiplanicie en la base meridional de los farallones superiores de Apacará-tepuí, sector norte del macizo, 2200 m, 31 I 1983, *Steyermark 128290* (VEN!); Macizo del Chimantá, sector SSE. Altiplanicie SE del Acopán-tepuí, cabeceras del Río Arauác, 1930 m, 14 February 1984, *Steyermark 129988* (VEN!); Camarcaibarai-tepuí, SW facing shoulder 1800–1825 m, 22–24 May 1986, *Steyermark 1311993* (MO!; VEN!) *ibid.* *Steyermark 1311993-A* (MO!).

OTHER RECORDS: VENEZUELA. Bolívar: Amurí tepuí, 29 January 2009, *Hingst s.n.*, digital image; Cima del Auyán-tepuí, 2300–2400 m, received May 2016, *Kaes 9*, digital image (AMO!); Abacapá-tepuí, observed 2011, *Wilson s.n.*, digital image; Southwestern slopes of Ptari-tepuí, in a *Bonnetia roraimae* Oliv. shrub patch on a sandstone boulder above Punto Phelps cave rock camp, 1900–2000 m, observed May 2018, *Wrazidlo s.n.*, digital image (AMO!); Summit plateau of Acopán-tepuí, observed January 2017, *Wrazidlo s.n.*, digital images (AMO!; LCDP voucher).

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