

A new species of *Blakea* (Melastomataceae: Blakeeae) with pendulous flowers from Costa Rica

FABIÁN A. MICHELANGELI^{1,3} & DANIEL SANTAMARÍA-AGUILAR^{2,4}

¹Institute of Systematic Botany, New York Botanical Garden, 2900 Southern Blvd, Bronx, NY 10458-5126, USA.

²Shirley C. Tucker Herbarium, Department of Biological Sciences, Louisiana State University, Baton Rouge, LA 70803-1705, USA.

³✉ fabian@nybg.org;  <https://orcid.org/0000-0001-7348-143X>

⁴✉ daniel.santamaria366@gmail.com;  <https://orcid.org/0000-0002-6339-8250>

Abstract

We describe *Blakea ricardoi* (Melastomataceae: Blakeeae), a species known only from the Parque Internacional La Amistad in Costa Rica side. It can be distinguished by the long peduncles up to 6.5 cm long, pendant flowers with green petals and indumentum of roughened trichomes. A key to other species of *Blakea* with pendulous flowers and connivent petals is provided.

Resumen

Describimos *Blakea ricardoi* (Melastomataceae: Blakeeae), una especie conocida solo del Parque Internacional La Amistad en el lado Costarricense. Se distingue por sus largos pedúnculos de hasta 6.5 cm de largo, flores péndulas con pétalos verdes e indumento de tricomas rugosos. Se incluye una clave para el grupo de especies de *Blakea* con flores péndulas y pétalos conniventes.

Keywords: taxonomy, Parque Internacional La Amistad

Introduction

Blakea P. Browne (1756: 323) is a genus of ca. 180 species of Neotropical woody plants, which vary in habit from shrubs to trees, epiphytes, hemiepiphytes or climbers. As currently circumscribed it also includes species formerly placed in *Topobea* Aublet (1775: 476), and along with *Chalybea* Naudin (1850: 99) it forms the tribe Blakeeae (Penneys & Judd 2011; Penneys & Judd 2013a; Penneys & Judd 2013b). The genus can be recognized by the presence of axillary inflorescences, flowers subtended by two pairs of decussate bracts and usually six-merous, dioplostemonous flowers with isomorphic stamens, although haplostemonous and tetramerous flowers are also known. The ovary is inferior or mostly so, and the fruits are berries. *Blakea* is found from Mexico, Jamaica and some islands in the Lesser Antilles to Bolivia and western Brazil and to Surinam, French Guiana, and northern Brazil in the east, being conspicuously absent from the remaining Greater Antilles and the Atlantic Forest. The greatest number of species is found in the Chocó biogeographical region (Penneys & Judd 2011; Penneys & Judd 2013a).

While there is a high diversity of floral morphology within the genus, a group of five species is remarkable in having a combination of characters otherwise rare in the genus and the Melastomataceae as a whole: they all share the presence of pendulous flowers with green (or partially green) petals that form a tube and do not spread open at anthesis, and copious nectar production. These five species include *Blakea purpusii* Brandegee (1914: 58) from Chiapas, Mexico, and Guatemala, *B. austin-smithii* Standley (1938: 1561) from the Cordillera Central of Costa Rica, *B. chlorantha* Almeda (1980b: 609) from the Cordillera de Tilarán of Costa Rica, *B. penduliflora* Almeda (1980a: 508) from the Cordillera Central of and Cordillera de Talamanca in Costa Rica, and *B. gregii* Almeda (1990: 305) from the mountains in Western Panama (Almeda 1990; Almeda 2009).

During field work in the Caribbean slope of eastern Costa Rica in Parque Internacional La Amistad the second author found a plant that also has pendant inflorescences and green petals. However, it did not match any of the aforementioned species. We describe here this new species.

The Parque Internacional La Amistad (PILA), is a binational park shared between Costa Rica and Panama, and it is one of the largest natural protected areas in Central America. The park is located in the Talamanca Cordillera, a mountain range that spans from near sea level to over 3800 at Cerro Chirripó in Costa Rica. The park spans ca. 200,000 ha. in each country, with 88% of the surface on the less explored Caribbean slope and 12% in the Pacific slope. Due to its location and elevational variation, PILA harbors a large diversity of habitats, with 11 different life zones, including páramos, cloud forests, and natural savannas, among others, resulting in a high amount of biodiversity (Monro *et al.* 2009).

The park's diverse flora harbors 3046 species of vascular plants, 2856 of them seed plants. Melastomataceae with 22 genera (in the traditional sense; following Almeda 2009) and 149 species is the fifth largest family in the park (Monro *et al.* 2017). *Blakea* (including *Topobea*) is one of the genera often found in the cloud forest, especially on the Caribbean slope, where 23 species have been reported (including the one being described here). The park plays an important role in the conservation of diversity of this genus because it harbors more than 2/3 of the 30 species reported for Costa Rica (Almeda *et al.* 2007).

As part of the *Baseline Tools for Management of the PN La Amistad* project led by Alex K. Monro and funded by the Darwin Initiative (DEFRA), an expedition to the Caribbean Slope of the Talamanca Cordillera was conducted in 2007, specifically to the northeast of Fila Matama near Cerro Asunción, Valle de la Estrella in the province of Limón, Costa Rica. The results of this expedition to this remote area have been remarkable, with several new plant taxa being described in the last few years (Miller 2016; Monro 2009; Ortiz & Croat 2016, 2017; Rodríguez & Monro 2008; Rodríguez & Solano Peralta 2018; Santamaría-Aguilar *et al.* 2015; Tebbitt *et al.* 2017). Additionally, this expedition also recorded the first specimens of *Blakea arboricola* (Almeda) Penneys & Almeda (Penneys & Judd 2013b: 23) for Costa Rica, a species previously known only from Panama. The same Caribbean slope of PILA had already yielded another new species of Melastomataceae, *Blakea bocatorena* Kriebel and Santamaria (2013: 1), but in this case from the Panamanian side of the park. It would not be surprising if additional new species in Melastomataceae and other families continue to be discovered as the area is further explored.

Material and methods

Measurements of vegetative parts and bracts were taken from herbarium specimens, while those of floral parts were taken from rehydrated material. Colors when provided are from photographs of live plants. Trichome terminology follows Wurdack (1986). Samples for scanning electron microscopy were taken from dried herbarium material and mounted on aluminum stubs with double sided conductive adhesive. These were then sputter-coated with gold-palladium at 15 mv for 5.5 min on a Denton Vacuum Desk V apparatus. Photographs were taken with the SE detectors on a Hitachi SU3500 at 5KV of accelerating voltage.

Results

Blakea ricardoi Michelang. & D.Santam. *sp. nov.* (Figs. 1, 2C–F, 3C–E).

Diagnosis:—A terrestrial shrub with pendant flowers and green petals that differs from *B. gregii* by the longer peduncles (5–6.5 cm vs 2–3 cm), and leaf indumentum of roughened trichomes 0.3–0.45 mm long (vs. smooth trichomes 0.8–1.7 mm long).

Type:—COSTA RICA. Limón: Valle de la Estrella, Fila Matama, Cerca de 11 km SW del pueblo de Aguas Zarcas. Punto 10C. 09°47'49"N 083°09'44"W, 1400–1500 m elev., 29 October 2007 (fl., fr.), Daniel Santamaria 6703 with D. Solano, M. Moraga, C. Godínez, A. Rodríguez (holotype MO-6646078 [barcode: 2855274]!; isotypes: CR [barcode: ex-INB 4125202]!, PMA-76446 [barcode: 77250]!, NY [barcode: 02146181; barcode: 02684958; barcode: 02685025]!).

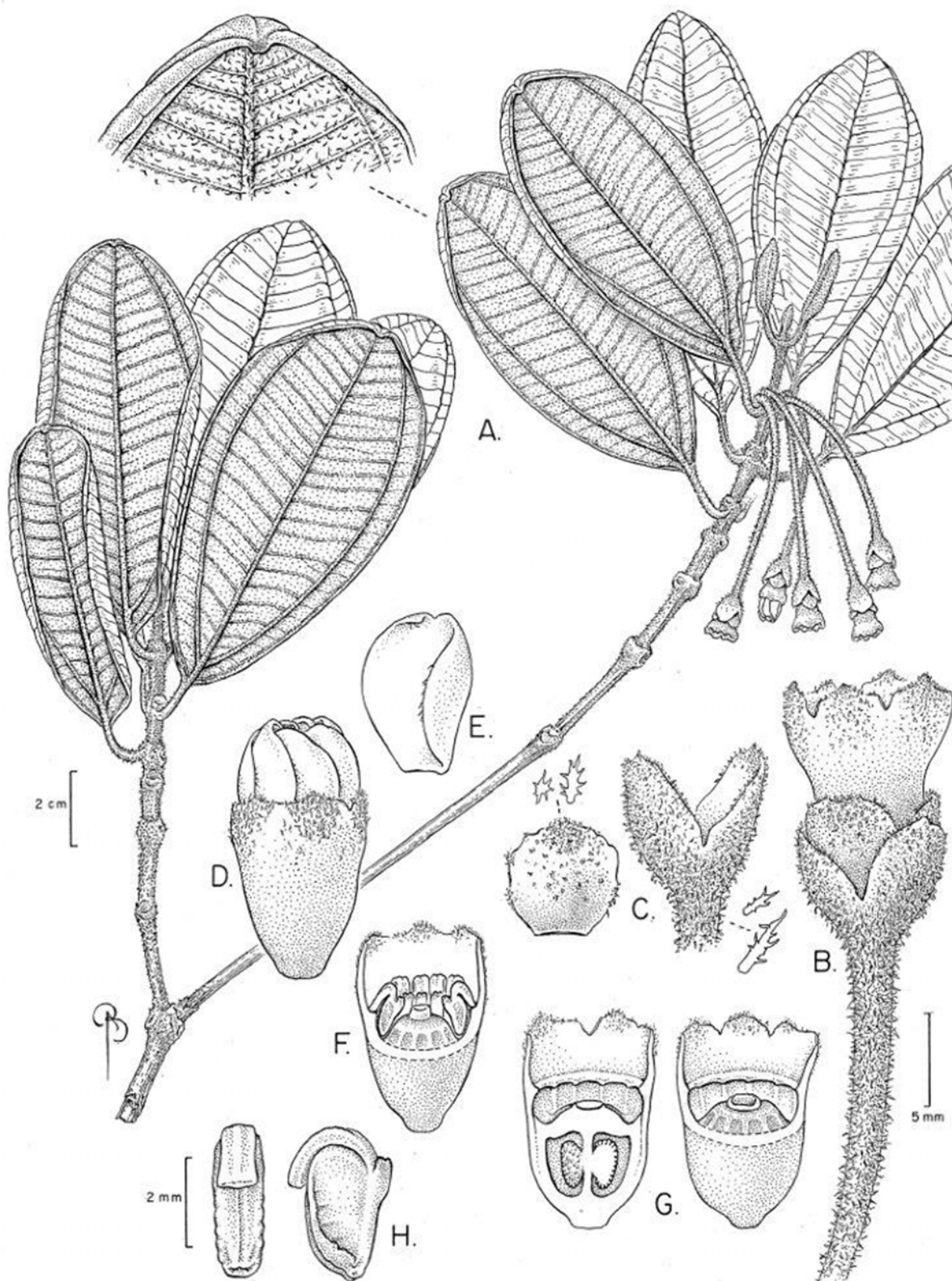


FIGURE 1. *Blakea ricardoii*. A. Flowering branch with detail of the leaf apex. B. Peduncle and immature fruit. C. Inner (left) and outer (right) bracts. D. Flower before anthesis. E. Petal. F. Flower bud, with petals removed and calyx in longitudinal section. G. Immature fruit in longitudinal sections. H. Anther from flower bud in dorsal (left) and lateral (right) view. (Drawn by Bobbi Angell from *Santamaria et al.* 6703, NY and MO).

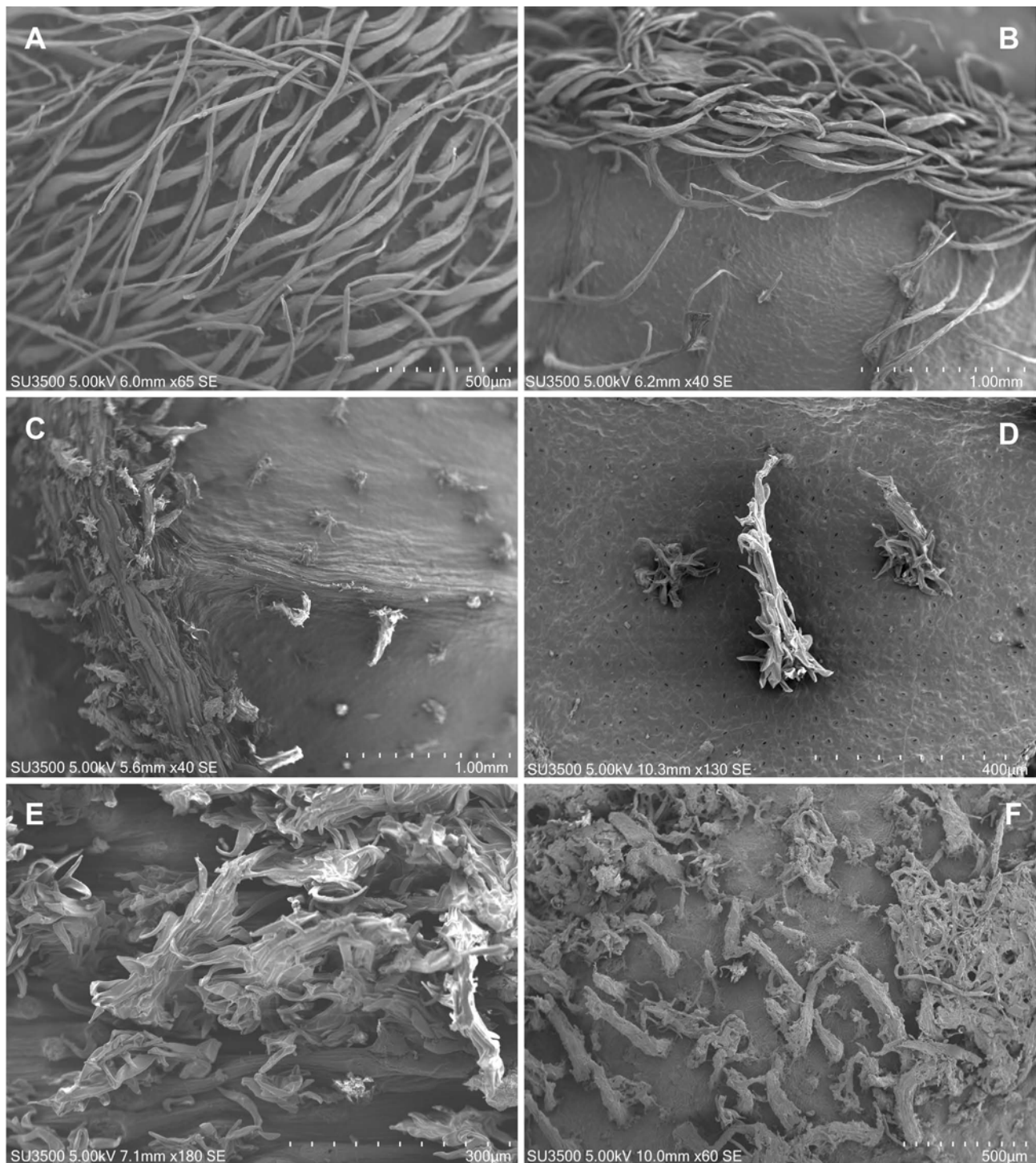


FIGURE 2. Scanning electron photographs of the indumentum of *Blakea gregii* and *B. ricardoi*. A–B. *Blakea gregii*. A. Adaxial surface of young leaf. B. Abaxial surface of young leaf. C–F. *Blakea ricardoi*. C. Adaxial surface of young leaf. D. Abaxial surface of young leaf. E. Detail of peduncle trichomes. F. Abaxial surface of outer floral bract. (A–B from *Almeda 6137*, NY; C–F from *Santamaría et al. 6703*, MO, NY).

Terrestrial shrub. Distal branchlets quadrate, becoming rounded with age, the younger nodes swollen up to 8.5 mm wide, with internodes 6–18 mm long, 4–6 mm wide, densely pubescent, the trichomes roughened, 0.5–1 (–1.2) mm long, later glabrate. Mature leaves isomorphic or nearly so; petioles 1.4–2 cm long, densely pubescent, the trichomes simple and moderately roughened, 0.4–1.1 mm long; blades 4.5–11.8 × 2.6–5.9 cm, subcoriaceous when dry, elliptic-ovate to obovate, apex rounded to very shortly acute or mucronate, base narrowly obtuse to rounded, margin markedly revolute (both live and when dry), the venation with one pair of secondary veins symmetrically diverging 4–7 mm above the base and running 4.5–7 mm from the margin, tertiary veins percurrent, spaced 3–5 mm apart at the widest portion

of the blade, all veins elevated on the abaxial surface, impressed to slightly impressed on the adaxial surface; young leaves densely pubescent on both surfaces, the trichomes roughened, 0.3–0.45 mm long, the surface quickly becoming very sparsely pubescent on the abaxial surface but persistent on the primary and secondary veins, and glabrous on the adaxial surface; domatia on adaxial leaf surfaces absent. Flowers pendant, solitary or in fascicles of up to 5 in the axils of the distal branches; peduncles 5.1–6.5 cm long, densely pubescent, the trichomes roughened, 0.35–0.5 mm long. Floral bracts thickened, sessile, entire; outer bracts 5.8–7.6 × 5–5.2 mm at anthesis (larger in young fruits), basally connate for 2–3.2 mm, elliptic to elliptic-ovate, apex round, margin sparsely ciliate, abaxial surface densely covered by roughened trichomes up to 0.5 mm long, denser towards the middle, with only a midvein visible, this slightly elevated but obscured by the trichomes, the adaxial surface glabrous; inner bracts 5.8–6.2 × 5.4–5.6 mm, free to the base, rotund to broadly ovate, the apex round, the margin sparsely ciliate, the adaxial surface with roughened trichomes as on the peduncles and outer bracts, these denser towards the apex and areas exposed in between the outer bracts, the midvein obscured by the trichomes. Hypanthium at anthesis campanulate to suburceolate, 7.5–8.8 mm long to the torus, 7.2–7.3 mm diameter distally at the torus, glabrous to very sparsely pubescent, the trichomes stellate (the bottom $\frac{3}{4}$ of the surface concealed by the inner bracts). Calyx tube 2.5–3.1 mm long, light green at the base, reddish towards the apex; calyx lobes erect, 1.1–1.3 mm long and 4.2–4.5 mm wide at the base, red, broadly ovate to deltoid-ovate with a blunt callose-thickened tooth on the abaxial apex of each lobe, roughened along interlobe sinuses, these tearing irregularly later in anthesis, adaxially sparsely pubescent, especially towards the apex, the trichomes sessile-stellate or shortly pedicellate-stellate, < 0.3 mm diameter, abaxially sparsely pubescent, the trichomes as on the abaxial surface and mostly restricted to near the apex. Petals 6, glabrous, connivent to imbricate when fully expanded, green, obovate, apically rounded to emarginate, otherwise margins entire but irregularly glandular-ciliate, mostly on the exposed margin, forming a tube, 8.5–10 × 7–8.2 mm. Stamens 12, isomorphic, free and encircling the exerted style; filaments complanate, glabrous, 4.5–5.1 mm long, 1.1 mm wide; anthers 3.4–4.1 mm long, 1.6 mm wide, purple, elliptic-oblong, laterally compressed, each anther tipped with two dorsally- to upright-inclined pores; connective dilated dorso-basally ca. 0.5 mm above the filament insertion into a blunt spur. Ovary inferior, 6-celled, the apex glabrous and 12-lobulate, lacking a cone or collar around the style insertion. Style straight, glabrous, 10–13 mm long, conspicuously exerted beyond the petals at anthesis, stigma truncate. Mature berries and seeds not seen.

Phenology:— Collected in flower and fruit in October.

Habitat and distribution:— *Blakea ricardoi* is only known from the type collection on the Caribbean slope of the Talamanca Cordillera in the Parque Internacional La Amistad. Only one individual was seen, growing 1400 and 1500 m elev., in a relatively open grassland, among some ferns [probably *Sticherus* Presl (1836: 51) and *Pteris* Linnaeus (1753a: 1073)], as well as with trees and shrubs of *Clethra* Linnaeus (1753b: 396) (Clethraceae), *Drimys granadensis* Linnaeus (1781: 269) (Winteraceae), *Miconia* Ruiz & Pavon (1794: 60) (Melastomataceae) and *Oreopanax* Decaisne & Planchon (1854: 108) (Araliaceae). Only a few yards from this individual, the field team also collected the types of *Ternstroemia amistadensis* Q. Jiménez & D. Santam. in Santamaría-Aguilar *et al.* (2015: 88), and *Burmeistera flava* Rodríguez & Solano Peralta (2018: 7). This area is also the habitat of *Byrsonima herrerae* Anderson (1995: 22) and *Zamia gomeziana* Acuña C. (2010: 29), unusual elements of the Costa Rican flora.

Conservation status:—*Blakea ricardoi* is known only from the type collection. Although this locality is inside a national park, the area is poorly collected. Based on the lack of information and the paucity of material we recommend that the species be considered Data Deficient (DD) under the IUCN guidelines (IUCN 2012; IUCN Standards and Petitions Subcommittee 2017).

Etymology:—It is a pleasure to honor our friend Ricardo Kriebel (1979–) with this species; Ricardo is a Costa Rican botanist who that has contributed greatly to our knowledge of the Mesoamerican Flora, particularly in the Dichapetalaceae, Gesneriaceae, Lamiaceae, Melastomataceae and Symplocaceae. Also, the second author is very grateful to him for personal support and motivation, and the first author for meaningful discussion in the field and laboratory.

Discussion:—Inflorescence and floral morphology undoubtedly places *Blakea ricardoi* in the *B. purpusii* group, characterized by pendant flowers that produce nectar and have green petals that form a tube at anthesis. Among these species, the lack of saccate appendages at the base of the leaf blade on the abaxial surface, calyx morphology, petal suggest a close affinity to *B. gregii*. Indeed, when keying out *B. ricardoi* in any of the keys that contain these species (Almeda 1990, 2000; Almeda 2009) it comes out with *B. gregii* and *B. purpusii*, but it does not match either one. *Blakea ricardoi* differs from *B. gregii* by the longer peduncles and the rest of the characters mentioned in the diagnosis. Additionally, the calyx lobes are shorter in *B. ricardoi* (1.1–1.3 vs. 2–4 mm long). It also differs from *B. purpusii* by the longer peduncles, smaller floral bracts and the presence of roughened trichomes (see key below).



FIGURE 3. Field photographs of *Blakea gregii* and *Blakea ricardoi*. A–B. *Blakea gregii*. A. Flowering branch with flowers and young fruits. B. Flower at anthesis. C–E. *Blakea ricardoi*. C. Leaf abaxial surface. D. Flowers in bud and at anthesis. E. Branch with young fruits. (A–B photographs by Petra Wester; C–D photographs by Daniel Solano).

Of the five previously described species in this group, three (*B. austin-smithii*, *B. chlorantha*, *B. penduliflora*) were included in the phylogenetic analysis by Penneys and Judd (2013a), and unsurprisingly, they all form a clade, sister to *B. fuchsiodes* Almeda (1989: 137), another species with pendant flowers, but with conspicuously longer red bracts and magenta to pink petals. Penneys and Judd (2013a) named this group the “vertebrate pollination clade”. *Blakea austin-smithii*, *B. chlorantha* and *B. penduliflora* had been suggested to be rodent-pollinated (Lumer 1980; Lumer & Schoer 1986; Lumer 2000), while *B. purpusii* has been reported as bird-pollinated (Lumer 2011). The notion of rodent

pollination in *Blakea* has been challenged based on observations of hummingbirds visiting the same species reported as rodent pollinated, and the absence of floral scents (Langtimm & Unnasch 2000; Wester *et al.* 2016). However, dual vertebrate pollination syndromes in other Melastomataceae have been found (Dellinger *et al.* 2019a; Dellinger *et al.* 2019b), and the floral morphology of the *Blakea purpusii* group resembles that found in some species of *Meriania* Swartz (1798: 823) with mixed vertebrate pollination syndromes. As already pointed out by Wester *et al.* (2016), this shows the need for further pollination studies in these species of *Blakea* involving both diurnal and nocturnal observations on the same individuals, and that assessment of effective pollen transfer by the different visitors.

The type material of *Blakea ricardoi*, was wrongly identified as *B. penduliflora* by the second author. Duplicates were distributed under this name, which was reported by Monro *et al.* (2017).

Key to the species in vertebrate pollinated clade sensu Penneys and Judd (2013a)

(modified from Almeda 1990, 2000; Almeda 2009; Michelangeli 2010)

1. Floral bracts red; petals magenta to pink.....*Blakea fuchsoides*
— Floral bracts green to brown; petals green or green with dark purple.
2. Leaves with a saccate appendage on the adaxial surface3
— Leaves flat on the adaxial surface, lacking a saccate appendage4
3. Younger internodes with trichomes 1–2 mm long; leaf blade margins denticulate and revolute; outer floral bracts linear-lanceolate, 1.5–2.1 cm long, equaling the calyx lobes at anthesis.....*Blakea austin-smithii*
— Younger internodes with trichomes 0.15–0.5 mm long; leaf blade margins entire and not revolute; outer floral bracts ovate to elliptic, 0.5–0.9 cm long, conspicuously shorter than the calyx lobes at anthesis.*Blakea chlorantha*
4. Peduncles and outer bracts glabrous to glabrate; outer floral bracts 1.2–1.8 cm wide*Blakea penduliflora*
— Peduncles and outer bracts pubescent; outer floral bracts 0.5–0.9 cm wide5
5. Peduncles > 5 cm long; leaves, bracts and peduncles with indumentum of roughened trichomes.....*Blakea ricardoi*
— Peduncles < 3.8 cm long; leaves, bracts and peduncles with indumentum of smooth trichomes6
6. Peduncles < 2 cm long; outer floral bracts 0.7–0.8 cm long; leaves on abaxial surfaces and veins with trichomes 1–2.5 mm long..
.....*Blakea gregii*
— Peduncles (2–) 2.8–3.8 cm long; outer floral bracts 1.3–2 cm long; leaves on abaxial surfaces and veins with trichomes < 0.5 mm long.....*Blakea purpusii*

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