

Two new species of *Werauhia* (Bromeliaceae) with spicate inflorescences from Costa Rica

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Abstract

Two new species of epiphytic bromeliads, *Werauhia estrellensis* and *W. picadoi*, belonging to the genus *Werauhia* (Bromeliaceae, Tillandsioideae) are described and illustrated from the mountain forests of Costa Rica. Both species inhabit the Talamanca mountain range at elevations between 1300 and 2200 m a.s.l. *Werauhia estrellensis* resembles *W. barii* but it is distinguished by its longer peduncle and green floral bracts, in contrast to yellow brown. *Werauhia picadoi* is similar to *W. vulcanicola* but it can be differentiated by its more robust size and acuminate leaf apex, as opposed to the rounded and apiculate apex of *W. vulcanicola*. Both new species are classified in section *Werauhia* and they are characterized by their spicate inflorescence, with rugose floral bracts arranged distichously (rather than secund) at anthesis. A key to related species with spicate and rugose floral bracts from southern Central America is included. A preliminary evaluation of their conservation status, based on IUCN criteria, classifies *W. estrellensis* as Vulnerable (VU D2) and *W. picadoi* as Least Concern (LC).

Key words: Bromeliads, Neotropics, Poales, Taxonomy

Introduction

Werauhia J.R. Grant (1995: 28) with 100 accepted species (Gouda & Butcher 2025, cont. updated) is the fourth most diverse genus of bromeliads in the subfamily Tillandsioideae (Bromeliaceae). Approximately, two-thirds of the species are concentrated in the Talamanca mountain range in southern Central America, which extends from Costa Rica to western Panama. The genus has been preliminarily retrieved as a monophyletic group in phylogenetic studies and included within the subtribe Cipuropsidinae, together with *Lutheria* Barfuss & Till (2016: 53) and *Jagrantia* Barfuss & Till (2016: 52). However, only six species were included, and a larger sampling is needed to test its monophyly properly. *Werauhia* species are distinguished by a combination of petals with dactyloid appendages at the base, stigma with cupular-type morphology, lacking papillae, and mostly nocturnal anthesis (Grant 1995).

The geographic distribution of *Werauhia* spans southern Mexico, Central America, Peru, Bolivia, and northeastern Brazil, with a few species in the Antilles (Krömer *et al.* 1999; Morales 2003a; Acevedo-Rodríguez & Strong 2012). Synoptic species descriptions and taxonomic keys are included in Flora Mesoamericana (Utley & Burt-Utley 1994) and the Manual de Plantas de Costa Rica (Morales 2003a). Afterward, except for the description of new species (e.g., Krömer *et al.* 2007; Morales 2009; Morales & Cerén López 2009; Aguilar-Rodríguez *et al.* 2020; Leme *et al.* 2020; Cascante-Marín & Morales 2021, 2023), a taxonomic treatment of the genus has not been published. Based on inflorescence architecture, Grant (1995) recognized two sections: *Werauhia* and *Jutleya* Grant (1995: 39), although

molecular data have not tested them. *Werauhia* species with spicate inflorescences are included in section *Werauhia* and constitute 44% of the known species.

Botanical explorations during several years to document the diversity and distribution of *Werauhia* in the central mountain region of Costa Rica have resulted in several specimens with distinct reproductive morphology, warranting their recognition as separate taxa. In this paper, we propose two new species characterized by their spicate inflorescence. This contribution raises the documented richness of *Werauhia* in Costa Rica to 63 species.

Material and methods

We conducted field trips to different locations in the Talamanca mountain range in the central region of Costa Rica during the years 2018, 2023, 2024, and 2025 to collect reproductive plants. Flowering plants were maintained under greenhouse conditions to monitor flower anthesis, and document floral morphology. Fresh flowers at anthesis were dissected, measured and photographed. After the flowering period, specimens were pressed and dried at the Herbarium Luis A. Fournier Origgi (USJ) facilities at the University of Costa Rica.

Descriptions were mainly based on herbarium specimens; measurements of floral parts were obtained from preserved flowers (in 70% ethanol) and fresh material. The botanical terminology used is based on Beentje (2010) for general terms, while specific terminology for the family is derived from Smith & Downs (1977) and includes modifications proposed by Scharf & Gouda (2008). Data regarding distribution, habitat, and phenology were gathered from herbarium vouchers and field notes. Additional specimens were consulted at the National Herbarium of Costa Rica (CR). We used the work of Morales (2003a) as the most recent taxonomic authority for the genus. Tropicos.org (2025) and JSTOR Global Plants (2025) were consulted to review citations and track type specimens. Herbarium acronyms are cited according to Thiers (2025, continually updated).

The collecting localities are shown on a topographic map created with QGIS 3.36.1 (QGIS Development Team 2024) and the elevation data layer from WorldClim 2.1 at a 30 second resolution (Fick & Hijmans 2017). A preliminary evaluation of their conservation status was conducted following the IUCN Red List Categories and Criteria (IUCN 2024); the Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using the GeoCAT tool (Bachman *et al.* 2011).

This paper follows the general concept of phenetic species, which posits that members of a taxon share morphological traits that distinguish them from related taxa (Stuessy 2009).

Taxonomic treatment

Werauhia estrellensis Cascante, *spec. nov.* (Figs. 1 & 2).

Diagnosis:—*Werauhia estrellensis* is morphologically similar to *W. barii* (Morales 1999: 401) J.F. Morales (2003b: 110) in its simple spicate inflorescence, foliose basal bracts of the peduncle and rugose floral bracts that are distichous (not secund) at anthesis. The new species differs from *W. barii* in having a longer inflorescence peduncle (46–58 cm vs. 30–43.5 cm), with a complanate spike (vs. subcylindrical). The floral bracts of *W. estrellensis* are green at anthesis, opposed to yellow brown in *W. barii*.

Type:—COSTA RICA. Cartago: El Guarco, San Isidro, Cordillera de Talamanca, zona protectora Río Navarro-Río Sombrero, aprox. 1 km S de La Cangreja, camino hacia poblado de La Estrella a aprox. 1.5 km desde la carretera interamericana, fragmento pequeño de bosque húmedo montano bajo, 9.786388° N, 83.966666° W, 1740 m, 05 April 2018 (fl), *Cascante-Marín 2754* (holotype: USJ, 111762!, isotype: CR!).

Plants epiphytic, acaulescent; formed by a single rosette, 75–95 (–110) cm in diameter, (35–) 45–60 cm tall. **Leaves** 17–23, with basal leaves curved and inner leaves obliquely ascending, forming a tank; **sheath** elliptic, 14.5–17.5 cm long, 7.7–9.0 cm wide, adaxially whitish-cream, lepidote on both surfaces and with a dark-brown horizontal band at the base abaxially (mainly in older leaves); **blade** ligulate, recurved toward the apex, with the apex long attenuated, (32–) 44–57.5 (–74) cm long, 3.5–4.8 (–5.6) cm wide, inconspicuously punctulate-lepidote adaxially and densely lepidote abaxially, concolorous, green. **Peduncle** terminal, erect, (40–) 46–58 cm long, 9–11 mm in diameter, partially covered by the bracts, glabrous; **peduncle bracts** overlapping, green, punctulate-lepidote, decreasing in size toward the apex; basal bracts foliose, ligulate-attenuate, 31.0–48.0 × 2.5–2.9 cm, distal bracts triangular, 7.0–12.0 × 1.0–1.3

cm, pale stramineous at the apex due to drying out during anthesis. **Inflorescence** simple, spicate, narrowly sub-oblong at anthesis, slightly flattened, erect, 30–35 cm long, 3.5–4.0 cm wide, 14–16-flowered, rachis covered by the floral bracts; **floral bracts** ovate, 6.0–6.5 × 5.2–5.7 cm, three times larger than the internodes, strongly imbricate, distichous, not secund with the flowers at anthesis, rugose, punctulate-lepidote, ecarinate, coriaceous, green with the apex drying during anthesis, non-protruding and adpressed on the next bract. **Flowers** pedicellate, secund, with nocturnal anthesis; **pedicel** stout, 6.1–8.7 mm long and 8.6–10.5 mm wide at the distal end; **sepals** free, ovate, chartaceous, concave, 2.9–3.4 × 1.6–2.0 cm, ecarinate, light green, lustrous and glabrous, slightly rugulose at the base; **corolla** tubular; **petals** free, white, ligulate, 5.7–6.7 × 1.2–1.8 cm, apex spreading and emarginate, bearing two appendages at the base; **appendages** elongated, 22–31 × 2–3 mm, basally adnate to the petal, apex dactyloid-dentate with 1–3 teeth; **stamens** subequal, similar in length to the petals, **filaments** free, linear, flattened at the base, 44.2–49.2 × ca. 1.5 mm, white; **anthers** dorsifixed, yellow, oblong, 1.2–1.3 cm long, asymmetrically arranged in the upper side of the corolla at anthesis; **ovary** epigynous, conical, white, ca. 8.8 mm long and 4.9–5.6 mm wide at the base; **style** white, 44.5–49 mm long; **stigma** cupulate, ca. 2 mm in diameter, at the same level of the anthers. **Capsule** fusiform, dark brown, 3.8–4.4 cm long, apiculate. **Seeds** brown, ca. 3.5 mm long, with a plumose white appendage, 15.5–16.8 mm long.

Etymology:—The specific epithet “estrellensis” is derived from La Estrella, a village situated in the Talamanca mountain range in the province of Cartago, Costa Rica. This name acknowledges the geographic proximity of La Estrella to the type locality where the species was first discovered and collected.

Distribution and habitat:—Mountains in the upper watershed of the Reventazón river on the Caribbean slope of the Talamanca mountain range in Costa Rica, province of Cartago, between 1740 and 1800 m a.s.l (Fig. 5). The vegetation is classified as Premontane Moist Forest and Lower Montane Wet Forest according to Holdridge’s Life Zones System (Bolaños & Watson 1993).

Ecology:—*Werauhia estrellensis* grows as epiphyte on the trunks and lower branches of trees in forested areas. Flowering in April and May. Anthesis occurs at night, with 1 to 3 flowers opening; corolla fading takes place the following morning. The white corolla, the anthesis behavior, and the production of nectar suggest that a nocturnal pollinator—likely nectarivorous bats—is involved, following the chiropterophilous pollination syndrome described by Faegri and van der Pijl (1979). Floral buds and developing fruits are frequently surrounded by a transparent mucilage that forms inside the floral bract.

Conservation status:—Vulnerable (VU D2). *Werauhia estrellensis* is known from only two locations within a highly fragmented forest habitat, surrounded by an area dominated by cattle and agricultural activities. Its Area of Occupation (AOO) is 8 km² and the Extent of Occurrence (EOO) is undefined but, in this case, should be equaled to the AOO (IUCN 2024). These locations are within but near the boundaries of the Río Navarro-Río Sombrero protected zone; these protected areas primarily aim to regulate hydrological processes. The potential future expansion of human activities in this area threatens to reduce the size and quality of the forest habitat needed for this epiphytic bromeliad and may lead this species to the status of Endangered (EN) or Critically Endangered (CR).

The estimated Area of Occupation (AOO) and Extent of Occurrence (EOO) meet the threshold for threatened status under criterion B. There is no evidence of continuing decline or extreme fluctuations in its area of distribution or demographic parameters. Considering the restricted distribution comprising an AOO < 20 km² and few locations (≤ 5), *W. estrellensis* is preliminary assessed as Vulnerable (VU), based on criterion D2 of the IUCN Red List Categories and Criteria (IUCN 2024).

Comments:—*Werauhia estrellensis* is morphologically similar to *W. barii* by its simple spicate inflorescence with foliose basal bracts on the peduncle. The inflorescences of both species are compact with tightly imbricate floral bracts that remain distichous at anthesis but differ in their coloration, greenish in *W. estrellensis* vs. yellow brown in *W. barii*. The inflorescence’s peduncle is longer in *W. estrellensis* (46–58 vs. 30–43.5 cm) and the inflorescence is complanate (versus subcylindrical) (Fig. 6A and 6B). *Werauhia estrellensis* can be placed within section *Werauhia* following Grant’s (1995) subgeneric categories, which includes plants with simple inflorescences. Following the taxonomic key provided by Morales (2003a), this new species belongs to a species group characterized by distichous floral bracts that are coriaceous and rugose or papillose-verrucose. Most of these species are endemic to the Talamanca mountain range in Costa Rica and, because of their similarity, are frequently confused with the common and widespread *W. gladioliflora* (Wendland 1863: 31) J.R. Grant (1995:31) from lower forest habitats below 1300 m a.s.l.

Additional specimens examined (Paratypes):—COSTA RICA. Cartago: El Guarco, San Isidro, Cordillera de Talamanca, zona protectora Río Navarro-Río Sombrero, aprox. 1 km S de La Cangreja, camino hacia poblado de La Estrella a aprox. 1.5 km desde la carretera interamericana, 5 April 2018 (fl), *Cascante-Marín & Trejos* 2755 and 2756 (both USJ); same locality, 13 November 2018 (fr), *Cascante-Marín & Trejos* 2816 (USJ); same locality, 23 May 2025 (fr), *Cascante-Marín* 3193 (USJ); Aguacaliente, Cordillera de Talamanca, límite norte de zona protectora

Río Navarro-Río Sombrero, fragmentos de bosque a lo largo de camino rural que va del poblado de Conventillo (en carretera interamericana) al poblado de Muñeco de Orosí, 9.801949° N, 83.932075° W, 1750–1800 m, 26 July 2024 (fr), *Cascante-Marín et al.* 3157 (USJ).

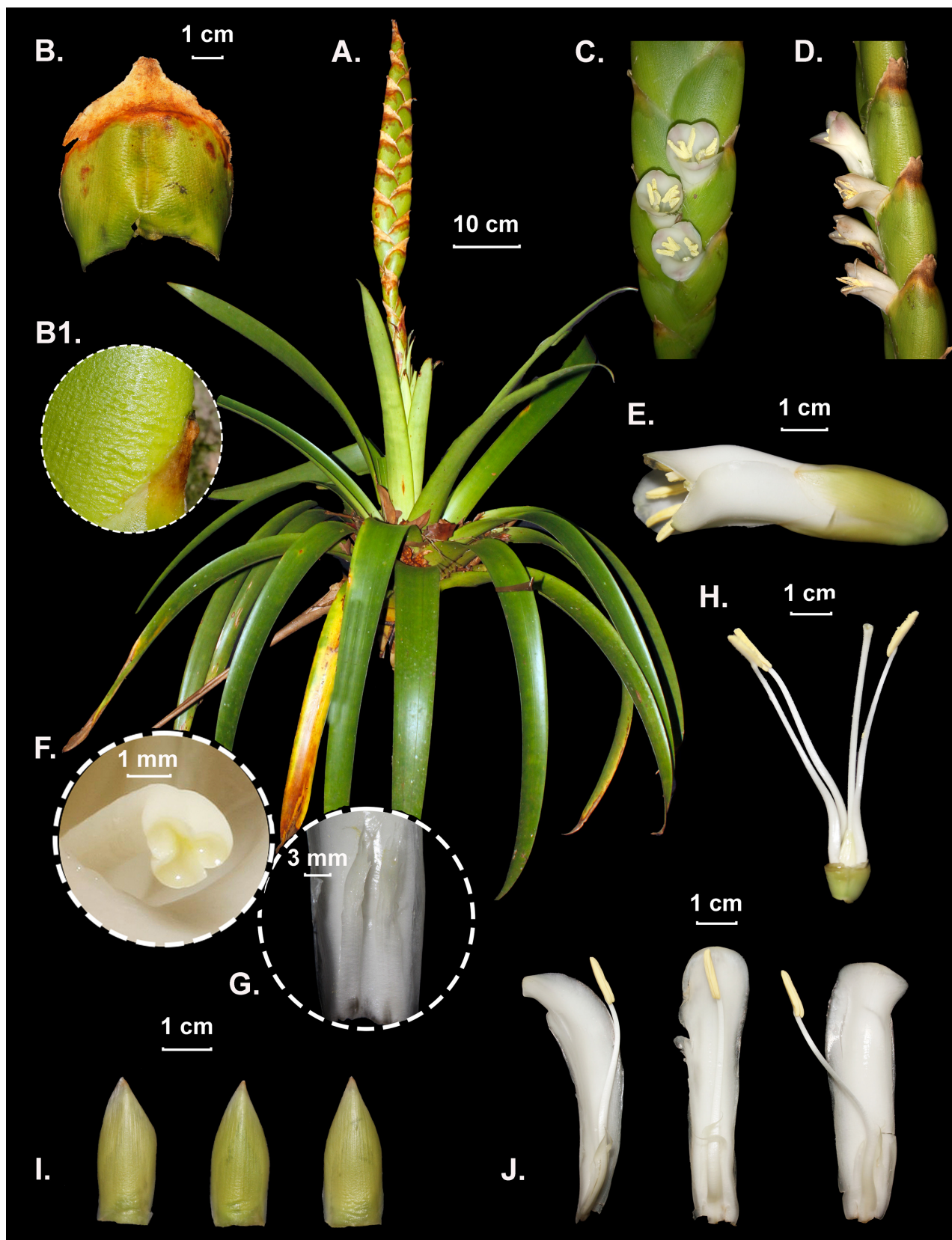


FIGURE 1. *Werauhia estrellensis* Cascante. **A.** Reproductive plant. **B.** Floral bract. **C.** Segment of flowering spike in ventral view. **D.** Segment of flowering spike in lateral view. **E.** Flower at anthesis (lateral view). **F.** Stigma. **G.** Basal appendages of petals. **H.** Pistil with pedicel and antepetalous stamens. **I.** Sepals. **J.** Petals with antepetalous stamens. Voucher: A. Cascante-Marín 2754 (USJ). Photos by A. Cascante-Marín.

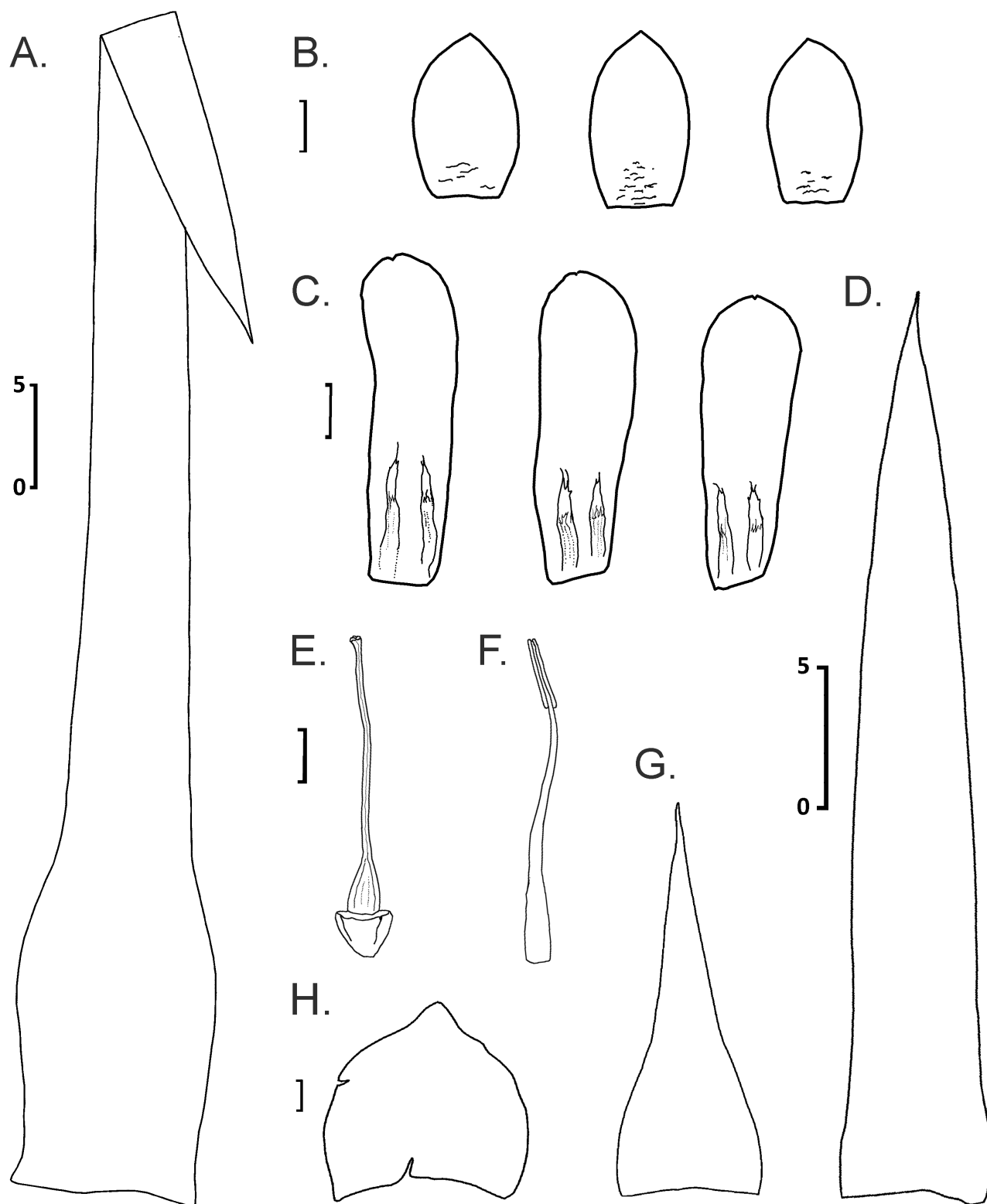


FIGURE 2. *Werauhia estrellensis* Cascante. Outline drawings of **A.** Leaf. **B.** Sepals. **C.** Petals with basal appendages. **D.** Basal peduncle bract. **E.** Pistil with pedicel. **F.** Stamen. **G.** Distal peduncle bract. **H.** Floral bract. Scale bars = 1.0 cm (unless otherwise indicated). Voucher: A. Cascante-Marin 2754 (USJ).

Werauhia picadoi Cascante, *spec. nov.* (Figs. 3 & 4).

Diagnosis:—*Werauhia picadoi* is morphologically similar to *W. vulcanicola* (Morales 1999: 405) J.F. Morales (2003b: 110) in their rugose floral bracts that show a protruding apex and are distichous (not secund) at anthesis. The new species differs from *W. vulcanicola* in having a longer inflorescence peduncle (46–53 cm versus 18–22 cm) and flowering spike with more flowers (13–19 versus 10–13).

Type.—COSTA RICA. Cartago: Paraíso, camino rural hacia Mirador Ecológico Montesky, en desviación sobre carretera nacional 408 y ca. 5.5–6 km del centro de Orosí hacia el parque nacional Tapantí, Cordillera de Talamanca (ladera Caribe), 9.745985° N, 83.833487° W, 1550 m, 16 June 2023 (fl), *Cascante-Marín 3098* (holotype: USJ, 128349!, isotype: CR!).

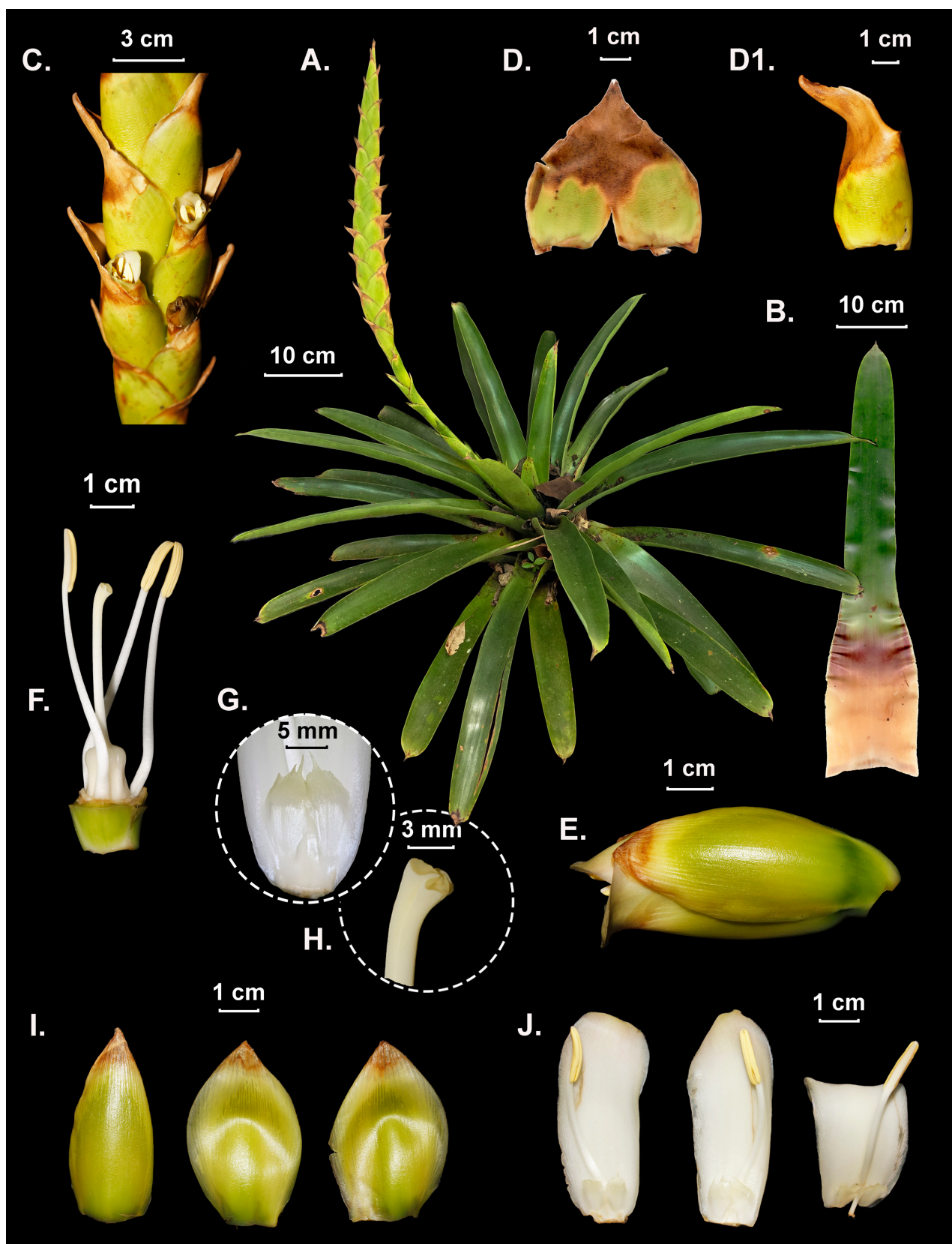


FIGURE 3. *Werauhia picadoi* Cascante. **A.** Reproductive plant. **B.** Entire leaf (scanned adaxial side). **C.** Segment of spike at anthesis in ventral view. **D.** Floral bract (expanded). **D1.** Floral bract in lateral view. **E.** Flower at anthesis (lateral view). **F.** Pistil with pedicel and antesealous stamens. **G.** Basal appendages of petal. **H.** Cupulate stigma. **I.** Sepals. **J.** Petals with antepetalous stamens. Voucher: A. Cascante-Marín 3098 (USJ). Photos by A. Cascante-Marín.

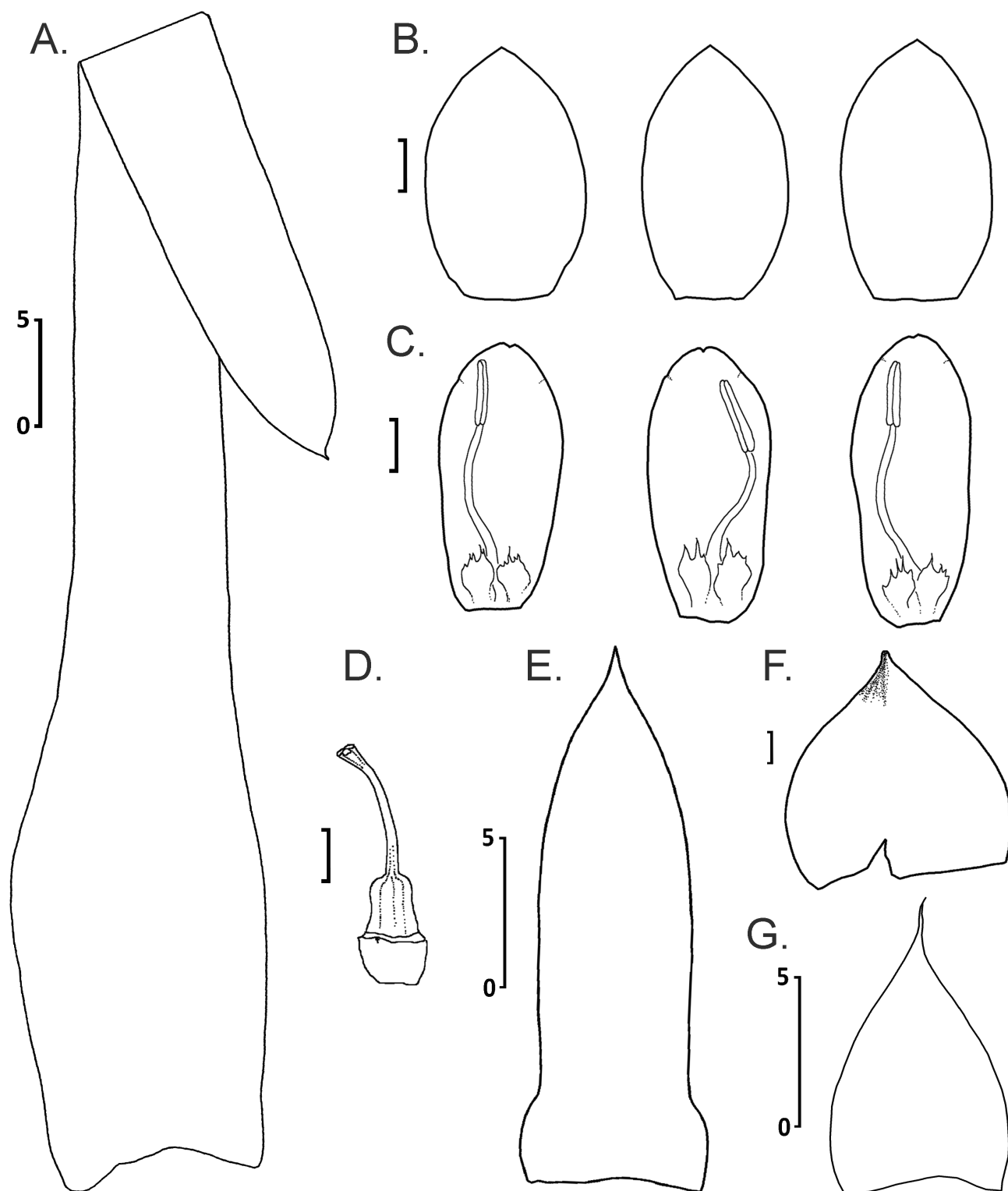


FIGURE 4. *Werauhia picadoi* Cascante. Outline drawings of **A.** Leaf. **B.** Sepals. **C.** Petals with antepetalous stamens and basal appendages. **D.** Pistil with pedicel. **E.** Basal peduncle bract. **F.** Floral bract. **G.** Distal peduncle bract. Scale bars = 1.0 cm (unless otherwise indicated). Voucher: A. Cascante-Marín 3098 (USJ). Drawings by A. Cascante-Marín.

Plants epiphytic, acaulescent; formed by a single rosette, 68–120 cm in diameter, 48–75 cm tall. **Leaves** 20–24 (–35), spreading to obliquely ascending, forming a tank; **sheath** elliptic, 15.5–21 cm long, 9.5–11.7 cm wide, whitish-cream, sometimes tinged purple adaxially and lepidote on both surfaces; **blade** ligulate, recurved toward the apex, with the apex acuminate, (35–) 46–61 cm long, (5–) 5.7–6.8 cm wide, inconspicuously lepidote on both sides, concolorous, green. **Peduncle** terminal, erect or suberect, (42.5–) 46–53 cm long, 15–18 mm diameter, covered by the bracts, glabrous; **peduncle bracts** overlapping, green, punctulate-lepidote, basal bracts subfoliose, ligulate and attenuate at the apex,

14–18 cm long, middle and distal ones ovate-triangular, acuminate to caudate, 7.0–8.0 cm long. **Inflorescence** simple, spicate, narrowly sub-oblong at anthesis, slightly flattened, erect, (26.5–) 30.5–38 × 4.0–4.5 cm wide, 13–19-flowered, rachis covered by the bracts; **floral bracts** ovate, 5.8–6.5 × 5.0–5.7 cm, three times larger than the internodes, strongly imbricate, distichous and not secund with the flowers at anthesis, rugose, punctulate-lepidote, ecarinate, coriaceous green with the apex drying during anthesis, the apex acute, slightly incurved with the margins involute, protruding and conspicuous. **Flowers** pedicellate, secund, with nocturnal anthesis; **pedicel** stout, 7.6–11.0 mm long and 10.6–14.0 mm wide at the distal end; **sepals** free, ovate to subelliptic, concave, chartaceous but membranaceous and hyaline along the upper margins, 4.2–5.0 × 2.8–3.5 cm, ecarinate, light green, lustrous, punctuated and striated; **corolla** tubular; **petals** free, white, ligulate, 4.7–5.2 × 1.9–2.4 cm, apex emarginate, bearing two appendages at the base; **appendages** obovate, 10.8–14.0 × 4.4–6.6 mm, basally adnate to the petal, apex dactyloid-dentate with 2–4 teeth; **stamens** similar in length to the petals, **filaments** free, linear, flattened at the base, 31.0–37.0 × 1.7–2.0 mm, white; **anthers** dorsifixed, yellow, oblong, 1.2–1.4 cm long, asymmetrically arranged at the upper side of the corolla at anthesis; **ovary** epigynous, oblong, white, 9.1–11.2 × 5.4–7.6 mm; **style** white, 25.0–29.0 mm long, slightly curved distally; **stigma** cupulate, ca. 3–4 mm in diameter, at the same level of the anthers. **Capsule** ellipsoid, dark brown, 3.4–3.8 cm long, apiculate. **Seeds** 3.4–3.6 mm long, with a plumose white appendage, 7.8–10.0 mm long.

Etymology:—The specific epithet “**picadoi**” honors the Costa Rican scientist Clodomiro Picado Twilight (1887–1944), in recognition of his outstanding contributions to science and medicine, and particularly for his pioneering ecological research on epiphytic bromeliads. His work *Les Broméliacées épiphytes comme milieu biologique* (Epiphytic bromeliads as biological environment) (Picado 1913) from his doctoral dissertation was one of the first studies on the biology and ecology of epiphytic bromeliads in tropical forests.

Distribution and habitat:—Mountain areas on the upper watershed of the Reventazón river (Caribbean slope) and Savegre river (Pacific slope) of the Talamanca mountain range, in the provinces of Cartago and San José, respectively, in Costa Rica, between 1300 and 2200 m a.s.l. (Fig. 5). The vegetation is classified as Premontane (Moist and Wet) Forest in the species’ lower distribution limit and Lower (Wet and Rain) Montane Forest at its higher elevation, according to Holdridge’s Life Zones System (Bolaños & Watson, 1993).

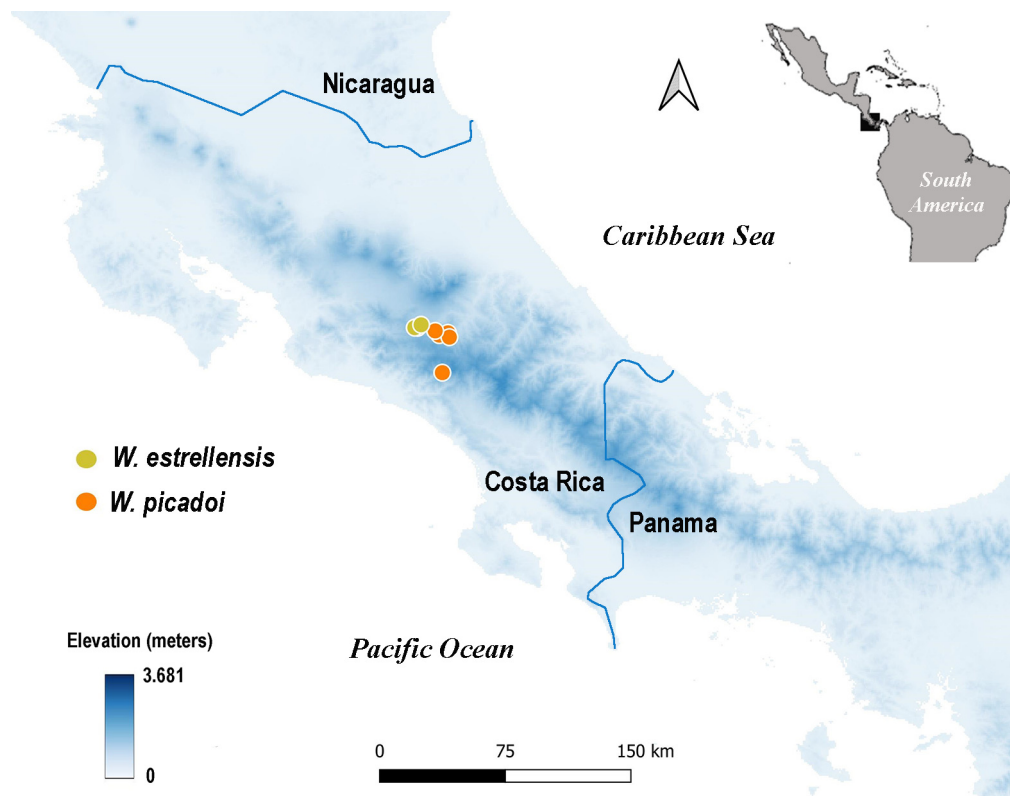


FIGURE 5. Topographic map of southern Central America (Costa Rica and Western Panama) showing the known localities of the new *Werauhia* species. The inset shows the location of the study area in the American Continent.

Ecology:—*Werauhia picadoi* grows as epiphyte on the trunks and lower branches of trees in forested areas. Flowering in June, July, and August. Like *W. estrellensis*, anthesis occurs at night, with one to three flowers opening;

fading takes place the following morning. This species also presents the chiropterophilous pollination syndrome (Faegri & van der Pijl 1979). Although *W. picadoi* occurs sympatrically with the previously described *W. estrellensis*, both species seem to show non-overlapping flowering periods (June to August vs. April and May, respectively).

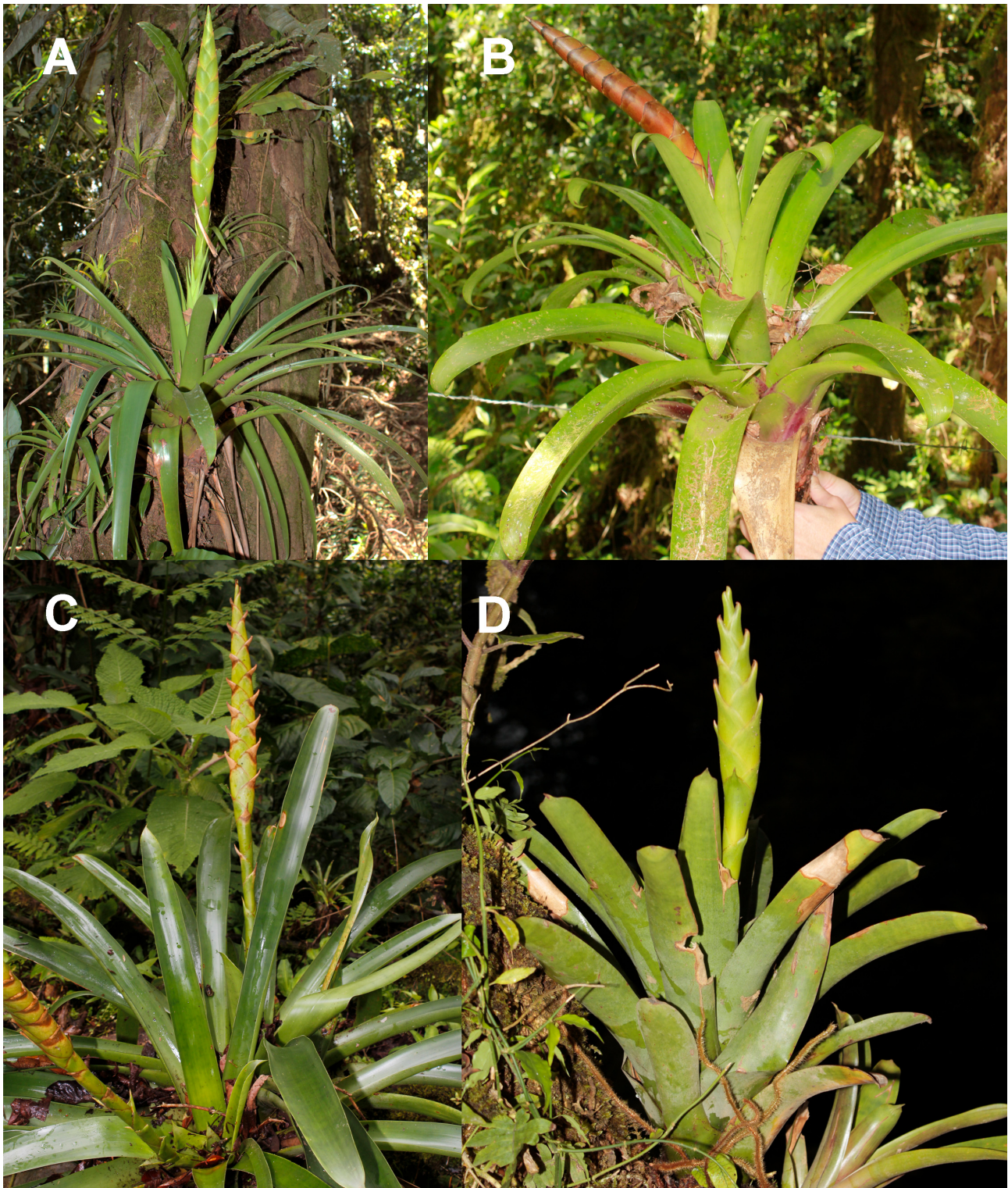


FIGURE 6. *Werauhia* species that are morphologically similar to the new species: A–B. *W. estrellensis* and *W. barii*. C–D. *W. picadoi* and *W. vulcanicola*. Photos by A. Cascante-Marín.

Conservation status:—Least Concern (LC). *Werauhia picadoi* is known from nine locations, some of which are situated within protected areas, including Tapanti-Macizo de la Muerte National Park, the Río Sombrero-Río Navarro protected zone, and the Los Santos forest reserve. The GeoCAT tool (Bachman *et al.* 2011) estimated an Extent of Occurrence (EOO) of 281.4 km² and an Area of Occupancy (AOO) of 32 km². Certain locations outside

these protected areas consist of small forest patches surrounded by pastures and agricultural land, which may face threats from the future expansion of human activities that could diminish both the area and quality of habitat for this epiphytic bromeliad. Conversely, the protected areas are connected to other conservation zones that together encompass a larger region of the Talamanca mountain range, providing habitats suitable for *W. picadoi*. These are extensive and continuously forested areas that remain largely unexplored from a botanical perspective; therefore, the Area of Occupancy and Extent of Occurrence for this new species might be underestimated at present.

The calculated Extent of Occurrence (EOO) and Area of Occupancy (AOO) meet the area requirement under criterion B for threatened status (EOO <20,000 km² and/or AOO <2,000 km²). However, subcriteria are not fully met except for the number of locations fewer than ten, while there is not any evidence of continuing decline or extreme fluctuations in its area of distribution, number of locations or demographic parameters. On the contrary, it seems reasonable to infer that additional locations may exist within the protected and continuous forest zones of the Talamanca mountain range, which could mitigate potential threats to this species. Consequently, *W. picadoi* is preliminarily assessed as Least Concern (LC) according to the IUCN Red List Categories and Criteria (IUCN 2024).

Comments:—This new species resembles the poorly known *W. vulcanicola* from the Guanacaste and Tilarán mountain ranges in the northwestern region of Costa Rica. Both species have rugose floral bracts with long apex and non-foliose bracts on the peduncle (Fig. 6C and 6D). The leaf apex in *W. picadoi* is acuminate (vs. rounded and apiculate in *W. vulcanicola*). Furthermore, *W. picadoi* is distinguished by its more robust appearance, its rosettes develop longer leaves (61.5–82 vs. 27–39 cm), longer peduncles (42.5–53 vs. 33–37 cm), and inflorescences (30.5–38 vs. 18–22 cm) with more flowers (13–19 vs. 10–13). Flowers of *W. picadoi* have longer sepals (4.2–5 vs. 3–3.4 cm). This new species is classified within the section *Werauhia* and, like the previously described species, is part of a group mainly found in mountain areas of Costa Rica which is characterized by spicate inflorescences featuring floral bracts that are either coriaceous and rugose or papillose-verrucose.

Additional specimens examined (Paratypes):—COSTA RICA. Cartago: Paraíso, parque nacional Tapantí-Macizo de la Muerte, cuenca del Reventazón, camino a Tausito, 1 km después del Alto Tractor, 9.734722° N, 83.778333° W, 1500 m, 14 March 2000 (fr), *Acosta & Ramírez 629* (CR); El Guarco, San Isidro, Cordillera de Talamanca, zona protectora Río Navarro-Río Sombrero, aprox. 1 km S de La Cangreja, camino hacia poblado de La Estrella a aprox. 1.5 km desde la carretera interamericana, 9.786388° N, 83.966666° W, 1740 m, 13 November 2018 (fr), *Cascante-Marín & Trejos 2820* (USJ); same locality, 30 July 2025 (fl), *Cascante-Marín & Trejos 3198* (CR, USJ); El Guarco, San Isidro, Cordillera de Talamanca (ladera Caribe), zona protectora Río Navarro-Río Sombrero, camino vecinal entre poblado de Palo Verde y La Estrella, remanente de bosque junto al camino, 9.786000° N, 83.951306° W, 1670 m, 05 April 2018 (fr), *Cascante-Marín & Trejos 2760* (USJ); same locality, 9.785926° N, 83.951385° W, 1640 m, 30 July 2025 (fl), *Cascante-Marín & Trejos 3199* (USJ). Aguacaliente, Cordillera de Talamanca (Caribe), límite norte de zona protectora Río Navarro-Río Sombrero, fragmentos de bosque a lo largo de camino rural que va del poblado de Conventillo (en carretera interamericana) al poblado de Muñeco de Orosí, 9.801777° N, 83.933594° W, 1765 m, 30 July 2025 (fl), *Cascante-Marín & Trejos 3200* (USJ); Paraíso, parque nacional Tapantí-Macizo de la Muerte, cuenca del Reventazón, parque nacional Tapantí, entre Quebrada Segunda y Patillos, 9.758333° N, 83.786111° W, 1300–1440 m, 17 June 2005 (fl), *Morales 13197* (CR); Paraíso, Orosí, Cordillera de Talamanca (ladera Caribe), cercanía a Embalse Los Llanos, camino desde planta eléctrica Río Macho, fragmentos de bosque, área no protegida, 9.768691° N, 83.855400° W, 1510 m, 29 August 2025 (fl), *Cascante-Marín & Trejos 3204* (USJ). San José: Pérez Zeledón, reserva forestal Los Santos, cuenca del Savegre, Río Savegre, sendero a Catarata Escondida, 9.541667° N, 83.816667° W, 2100–2200 m, 22 June 2004 (fl), *Morales 10829* (CR).

Artificial identification key to the *Werauhia* species with spicate inflorescences and rugose or papillose-verrucose floral bracts from southern Central America (Costa Rica and western Panama); adapted and modified from Morales (2003a).

1	Floral bracts papillose-verrucose.....	2
-	Floral bracts rugose or rugulose	3
2	Leaf blade 2.5–8 cm wide, peduncle erect or suberect, 63–74 (–90) cm long.....	<i>W. haberi</i> (Costa Rica)
-	Leaf blade 1–1.3 cm wide, peduncle decurved and horizontal, 38–41 cm long	<i>W. anitana</i> (Costa Rica)
3	Floral bracts secund with the flowers at anthesis	4
-	Floral bracts distichous, not secund with the flower at anthesis	7
4	Floral bracts thin coriaceous or membranaceous, decomposing after anthesis.....	<i>W. tiquirensis</i> (Costa Rica)
-	Floral bracts coriaceous or chartaceous, persistent after anthesis	5
5	Leaf apex attenuate, flowering rachis 16–65 cm long, floral bracts imbricate, 3.9–5.8 cm long	<i>W. tonduziana</i> (Costa Rica)
-	Leaf apex rounded and apiculate, flowering rachis 7–16 cm long, floral bracts loosely imbricate, 3.1–4.6 cm long.....	6

6	Sepals 2.7–3.3 cm, rounded.....	<i>W. burgeri</i> (Costa Rica and western Panama)
-	Sepals 3.5–4 cm, acute	<i>W. woodsoniana</i> (Panama)
7	Apex of floral bracts protruding and conspicuous	8
-	Apex of floral bracts not protruding and adpressed on the next bract.....	9
8	Leaves (50.5–) 61.5–82 cm long, apex acuminate, peduncle (42.5–) 46–53 cm long, floral bracts 5.8–6.5 cm.....	<i>W. picadoi</i> (Costa Rica)
-	Leaves 27–34 cm long, apex rounded and apiculate, peduncle 33–37 cm long, floral bracts 5.2–5.9 cm	<i>W. vulcanicola</i> (Costa Rica)
9	Basal bracts of peduncle foliose, the peduncle partially covered by these bracts	10
-	Basal bracts of peduncle not foliose, the peduncle visible for most of its length	11
10	Peduncle (18.5–) 29–37.5 (–40) cm long, inflorescence sub-cylindrical, floral bracts yellow brown at anthesis.....	<i>W. barii</i> (Costa Rica)
-	Peduncle (40–) 46–58 cm long, inflorescence slightly flattened, floral bracts green but drying out at the apex at anthesis.....	<i>W. estrellensis</i> (Costa Rica)
11	Floral bracts loosely imbricate at anthesis, internodes visible, inflorescence slightly flattened, floral bracts acute	<i>W. rugosa</i> (Costa Rica)
-	Floral bracts tightly imbricate at anthesis, internodes not visible, inflorescence sub-cylindrical, floral bracts obtuse to rounded	<i>W. gladioliflora</i> (from southern Mexico to Bolivia and northern Brazil)

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