



Two new species in *Tillandsioideae* (Bromeliaceae) of Machu Picchu, Peru

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Abstract

Two new species belonging to the subfamily *Tillandsioideae* from Machu Picchu, Cusco, Peru are described and illustrated here. The new species *Tillandsia machupicchuensis* is close to *T. tovarensis* and the other new species *Guzmania inkaterrae* is close to *G. morreniana* and *G. tenuifolia*. Both species are abundant in the area.

Key words: Taxonomy, Flora of Peru, *Tillandsia*, *Guzmania*

Introduction

During our expedition to Machu Picchu (the famous Inca ruins) two unknown and very abundant *Tillandsioideae* attracted our attention. One remarkable *Tillandsia* species grows by the thousands on steep rocky face along the Rio Urubamba near Aguas Calientes. There are two colour forms: one with green rosettes and one with red rosettes. Some rocky faces seem to be covered by the green ones and other rocky faces in the neighbourhood are covered by red rosettes. Remarkably some other rocky faces have a mix of both, having a mosaic of red and green rosettes so the coloration seems not to be triggered by exposure to sun light only. Some plants can be found on the Inca ruins, but are probably planted there.

Another unknown *Guzmania* species was planted by the thousands at the Inkaterra Machu Picchu Pueblo Hotel, where we were invited to stay for a few days to make an inventory of the *Bromeliaceae* in their remarkable natural gardens (mainly orchid garden) of this beautiful hotel that consist several small buildings build between the mountain forest that was left in tact. Two *Guzmania* species were used as massive planting along the pathways. Most abundant was this new species and in between *G. cuzcoensis* Smith (1972: 445) was also found.

Both *Guzmania* species can be found as epiphytes in trees along the Rio Urubamba near Aguas Calientes, where it grows with several other *Tillandsioideae* like *Tillandsia confinis* Smith (1953: 218), known from that area as *Tillandsia dudleyi* Smith (1974: 32; see Gouda 2011), *Tillandsia appendiculata* (= *T. engleriana*?) Smith (1949: 307) and *Tillandsia fendleri* Grisebach (1865: 17). The *Tillandsia* species are growing in the more sun exposed places, whereas the *Guzmania* species are found in the interior of the mountain forest.

Taxonomy

Tillandsia machupicchuensis Gouda & Julio Ochoa *sp. nov.* (Fig. 1–3)

This new species is characterized by its large green saxicolous rosettes, a very thick curved peduncle bearing a more or less horizontal bright red cylindrical twice-branched inflorescence of about 20 short spreading branches.

Type:—PERU. Dept. Cusco: Prov. Urubamba, Distr. Machupicchu, S. of Aguas Calientes, saxicolous on steep rocky face near Rio Urubamba, Elevation 2079 m, S 13°09.532, W 72° 31.430, very abundant, 31 July 2010, *Fernandez, R. et al.* 3574 (holotype USM, isotype L).

Plant acaulescent, ca. 50 cm tall, flowering not taller, subdense, with 20–30 leaves, forming a broadly funnellform rosette, green or red. Leaves thin coriaceous, 55 cm long, much shorter than the inflorescence. Sheaths ample, slightly contracted into the blades, thin coriaceous, elliptic, not or slightly inflated, 13 × 8 cm, with membranaceous margins, densely lepidote (less toward the base) on both sides, with closely appressed, dark centred scales, pale brown. Blades slightly arching at the base, somewhat stiffly thin coriaceous, channelled, linear-lanceolate or ligulate, 42 × 5.5 cm, attenuate, apiculate, sparsely lepidote (less lepidote adaxially), with closely appressed, transparent scales, green or reddish.

Inflorescence twice-branched, of ca. 20 primary branches, (including peduncle) 110 cm long; fertile part elongate, lax, ca. 60 × 20 cm, red. Peduncle wholly covered by bracts, recurved, 50 cm long, 10 mm in diameter, glabrous. Peduncle-bracts erect, the lower ones foliaceous, densely imbricate, chartaceous, the upper lanceolate, attenuately acute or apiculate, much exceeding the internodes, minutely lepidote, red or with greenish blade. Axis wholly exposed, stout, nearly straight, bluntly angled, glabrous, brightly red. Primary-bracts like the upper peduncle bracts and soon becoming much smaller, spreading with the branches, remote, stiff chartaceous, narrowly ovate, apiculate, much exceeding the stipe of the branches (mostly about the length of its axis), sparsely lepidote toward apex and inside, red or the lower with greenish blade. Stipe of the primary branches short, 1–2 cm long, not bracteate or rarely with one or some sterile bracts at distal end, spreading to a right angle with the axis to recurving, stout, glabrous, red. Spikes spreading and often slightly decurved, distichously, densely, (3–)6–10-flowered, complanate, lanceolate, acute or obtuse, (2.0–)3.5–5.5 × 1.2–1.4 cm, with a few sterile bracts at apex (and base). Rachis partly exposed (nearly wholly when dry), stout, slightly flexuous, excavated next the flowers (alate) 4-carinate, glabrous. Floral-bracts suberect, densely imbricate, stiff-chartaceous, prominently nerved, bicarinate at the base and carinate toward apex, triangular ovate, with broad hyalin margins, fleshy apiculate, incurved toward the apex, 1.2–1.5 × 0.8–1.0 cm, twice as long as, to three times as long as the internodes, much exceeding the sepals, glabrous outside punctulate-lepidote of brown centred scales inside, bright red.

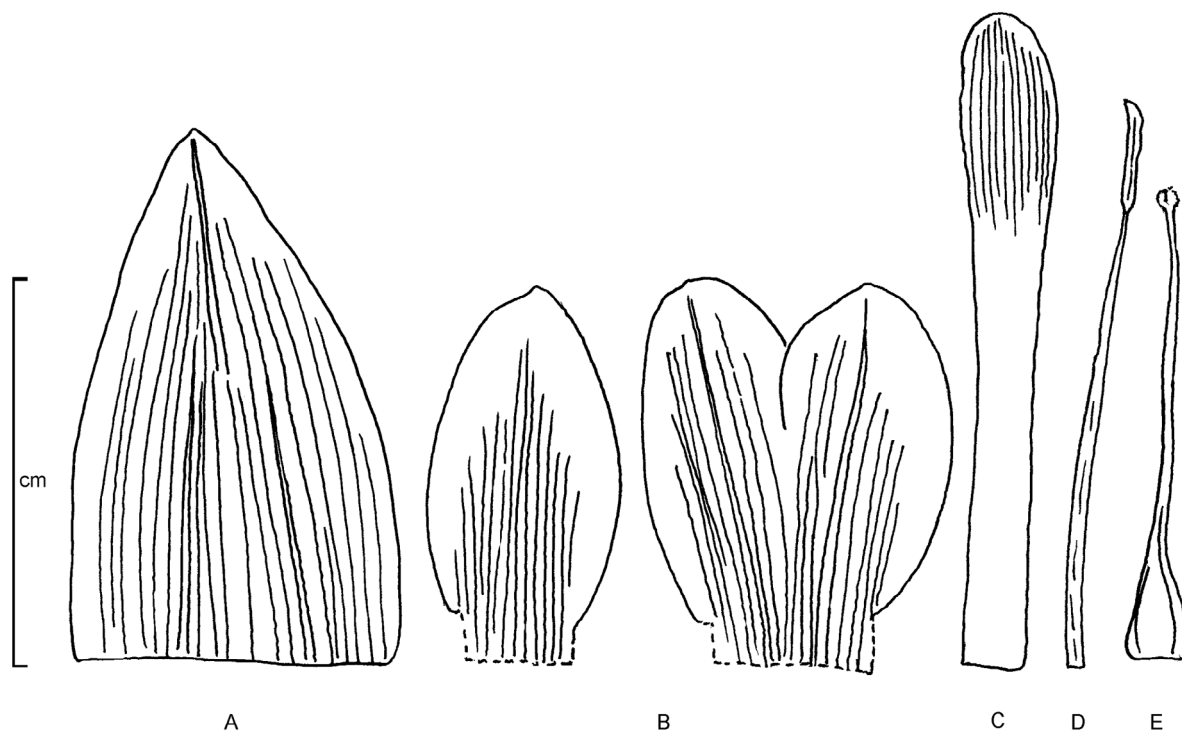


FIGURE 1. Drawing of the flower parts of the type specimen of *Tillandsia machupicchuensis* **A.** Floral bract. **B.** Sepals (abaxial one on the left). **C.** Petal. **D.** Stamen **E.** Pistil.



FIGURE 2. *Tillandsia machupicchuensis* **A.** Habit. **B.** Detail of part of the inflorescence and flowers.

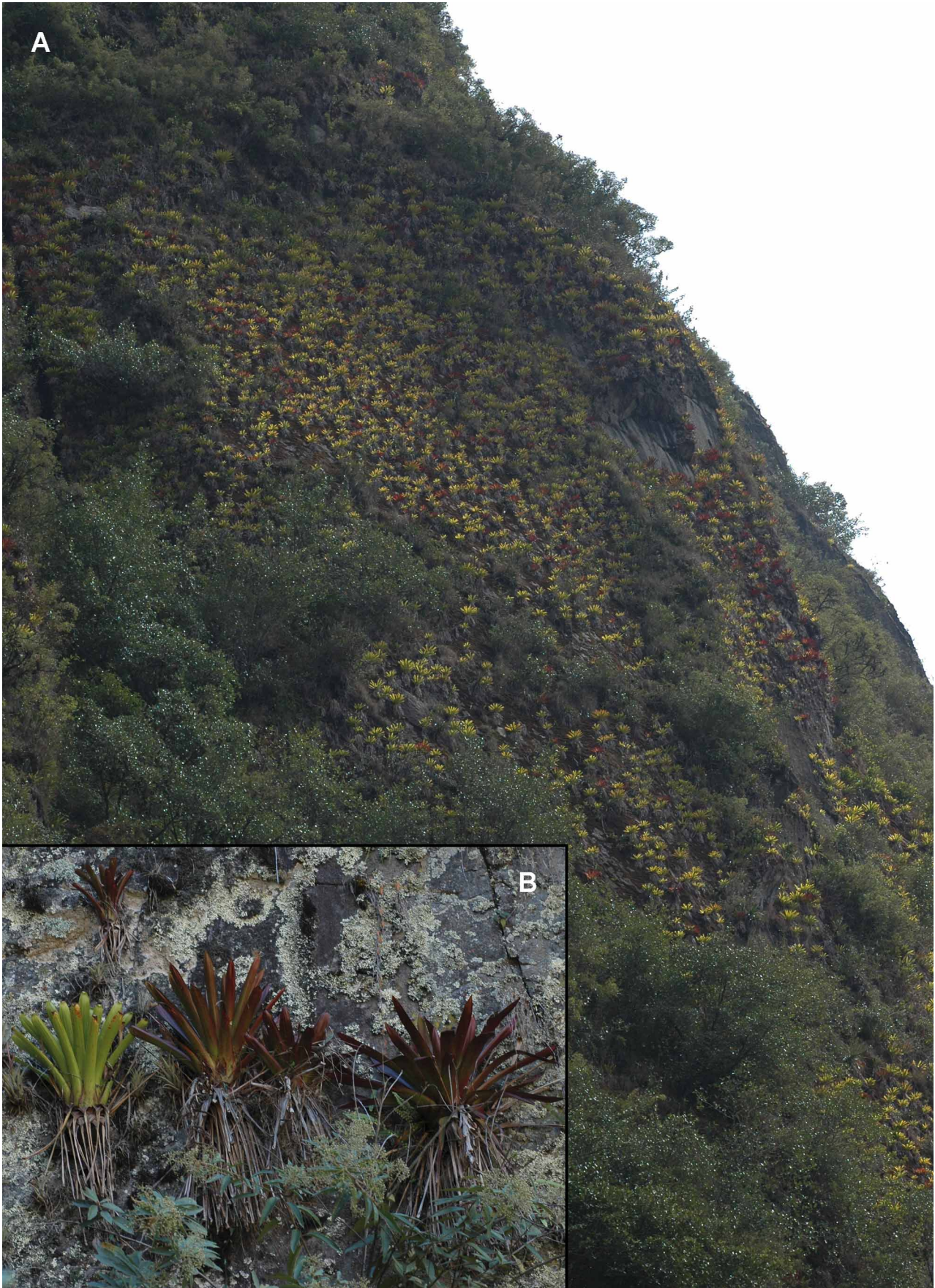


FIGURE 3. Rocky mountain face with a mix of green and red rosettes of *Tillandsia machupicchuensis* **A.** Overview. **B.** Some of the rosettes attached to the steep wall.

Flowers contiguous, 2 cm long, subsessile. Pedicel obcuneate, alate bicarinate, 2 mm long and 2 mm in diameter. Sepals subcoriaceous, slightly nerved, elliptic, broadly rounded or apiculate, incurved toward the apex, 1.0 × 0.6 cm, with broad hyaline margins, subdensely lepidote of brown centered scales, only inside, red, adaxial ones distinctly carinate, highly connate for 6 mm (abaxial one only 1 mm connate). Petals with the apex of the blade spreading to recurving, ligulate, 1.70 × 0.25 cm, rounded, purplish blue. Stamens exceeding the pistil, included. Filaments flaccid, all equal in length, 1.2 cm long. Anthers, 3 mm long basifixed, sagittate with relative large free lobes at the base, apiculate. Pistil exceeded by the stamens 13 mm long. Ovary ovoid, 4 mm long, tapering into the style. Style slender. Stigmas erect, short.

Distribution and habitat:—Saxicolous on steep rocky face near Rio Urubamba, Cusco, Peru at an estimated elevation of 2070–2300 m.

Etymology:—This *Tillandsia* is named after the Inca ruins known as Machu Picchu.

Observations:—This new species resembles its closest relative *Tillandsia tovarensis* Mez (1896: 769) that in general forms slightly smaller rosettes with erect and pyramidal paniculate inflorescence (the lower primary branches much longer than the upper ones, the rachis of the primary branches many times longer than the spikes) and grows mainly as an epiphyte. *T. machupicchensis* has the inflorescence bent over (away from the rocky face) by a thicker and the strongly curved peduncle and a more or less horizontal cylindrical inflorescence (all branches about the same length and the rachis of the primary branches shorter or about the length of the spikes) and is only observed saxicolous on steep rocky face. The floral bracts tend to be slightly taller (up to 15 × 10 mm) bicarinate at base and distinctly carinate at apex (vs. about 12 × 8 mm and ecarinate in *T. tovarensis*); adaxial sepals are distinctly carinate and highly connate for 6 mm apex (vs. ecarinate and short connate in *T. tovarensis*).

***Guzmania inkaterrae* Gouda & C. Soto sp. nov.** (Fig. 4–6)

This new species is characterized by its large size (ca. 130 cm), its elongate peduncle and dense globose to ovoid inflorescence, that is in general not very colourful, with relatively large floral bracts (3.5 × 2.0 cm), flowers (4.5 cm) and sepals (27 × 9.5–11.0 mm).

Type:—PERU. Dept. Cusco: Prov. Urubamba, Distr. Machupicchu, S. of Aguas Calientes, Rio Urubamba, elevation 2079 m, S 13°09.532, W 72°31.430. Epiphyte on stem of a small tree near the river, 31 July 2010, *Fernandez, R. et al.* 3577 (holotype USM, isotype L).

Plant acaulescent, flowering ca. 130 cm tall, subdense, with ca. 40 leaves, forming a open rosette, green. Leaves chartaceous, ca. 110 cm long, much shorter than the inflorescence. Sheaths ample, merging into the blades, chartaceous, narrowly ovate, not inflated, 28 × 9 cm, with membranaceous margins, densely lepidote on both sides but less toward distal end, with closely appressed small, brown scales, pale brown to dark brown toward the base abaxially. Blades arching, somewhat stiffly, chartaceous, channelled especially in lower part, linear, ca. 80 × 4.5 cm, attenuate, very narrowly acute, minutely lepidote, with appressed, transparent scales, less lepidote adaxially (subglabrous), green. Inflorescence (including peduncle) 130 cm long, sub-digitately compound, of about 20 branches; fertile part very dense, 9 × 8 cm, globose to ovoid, green with brown or slightly reddish. Peduncle elongate, wholly covered by bracts, erect, 120 cm long, 10 mm in diameter, glabrous, brown. Peduncle-bracts erect, the lower ones foliaceous, densely imbricate, chartaceous, the upper ones 7 × 3.5 cm, elliptic and several clasping the fertile part of the inflorescence, cuspidate to acuminate (the upper ones), much exceeding the internodes, sparsely lepidote, brown with green and often longitudinal reddish striped and marginate blade or acumen. Axis completely hidden by bracts and branches, stout, straight, about 5 cm long. Primary-bracts like the upper peduncle bracts, divergent with the branches, imbricate, stiff chartaceous, orbicular, apiculate to obtuse, shorter than the axillary branches, glabrescent or minutely lepidote toward the apex, brown with green upper half or margins. Stipe of the branches (spikes) indistinct or very short. Spikes sub-erect, polystichously, very densely, about 10-flowered, ellipsoid, acute, 5 × 2 cm. Rachis hidden, much reduced. Floral-bracts suberect, very densely imbricate, thin coriaceous, even,

carinate especially in upper half, oblong-ovate, in lower half with broad hyaline margins, fleshy apiculate to obtuse at apex, strongly incurved from base to apex, 3.5×2.0 cm, many times as long as the internodes, much exceeding the sepals, sparsely punctulate lepidote at both surfaces, ochraceous to green toward the apex, often with red or brown margins.

Flowers contiguous, 4.5 cm long, subsessile. Pedicel 3 mm long 7 mm wide, stout, bicarinate, glabrous. Sepals chartaceous, slightly nerved inside, narrowly obovate, slightly asymmetric, obtuse slightly cucullate, incurved, 27×9.5 – 11.0 mm, with broad hyaline margins and apex, sub-evenly short connate for 2.0–3.5 mm, sparsely to subdensely punctulate lepidote, less lepidote outside, green, posterior ones distinct from the anterior ones, carinate. Petals not fleshy, with divergent to recurving blade, spatulate, 42×9 mm (the claw 6 mm wide), with obovate (15×9 mm) blade, for 25 mm connate to each other and adnate to the filaments, forming a tube (about equalling or exceeding the sepals), obtuse and slightly cucullate, white. Stamens shorter than the pistil, exerted (caused by spreading of the petal-blades). Filaments lower part thin, all equal in length, 3.5 cm long, highly adnate to the petals, free part s-curved and fleshy. Anthers dorsifixed, at about one fourth from base, linear-sagittate, with free lobes at base and apex, 8×2 mm. Pistil 4 cm long exceeding the stamens. Ovary ovoid, 6×3.5 mm, tapering (from near base) into the style. Style slender, elongate and many times as long as the ovary. Stigmas lobed weakly conduplicate and strongly fringed.

Distribution and habitat:—Epiphytic on trees in the interior of the mountain forest along the Rio Urubamba, Cusco, Peru at an elevation of about 2070 m.

Etimology:—This *Guzmania* is named in honour of the Inkaterra organisation of Machu Picchu Pueblo Hotel, its owner José Koechlin and the head of the gardens Carmen Soto, who are very enthusiastic about the native plants, the biodiversity and the environment of that area.

Observations:—This new species resembles *Guzmania morreniana* Mez (1896: 932) and *Guzmania tenuifolia* (H.Luther) Betancur & Salinas (2003: 23), but differs from them by its larger size and flower parts. The plant is flowering about 130 cm tall (vs. 60 cm in *G. tenuifolia* and 100 cm in *G. morreniana*), its floral bracts are 3.5 cm long (vs. 2 cm in *G. tenuifolia* and 2.5 cm in *G. morreniana*), its sepals are 27 mm long (vs. 16 mm in *G. tenuifolia* and 20 mm in *G. morreniana*). It shares the greenish coloration of the inflorescence with *G. tenuifolia* that is red in *G. morreniana* as shown in the plate of its basionym *Schlumbergera morreniana* (hort. Linden) Morren (1883: 46). As far as I know, no photographs of this species are known.

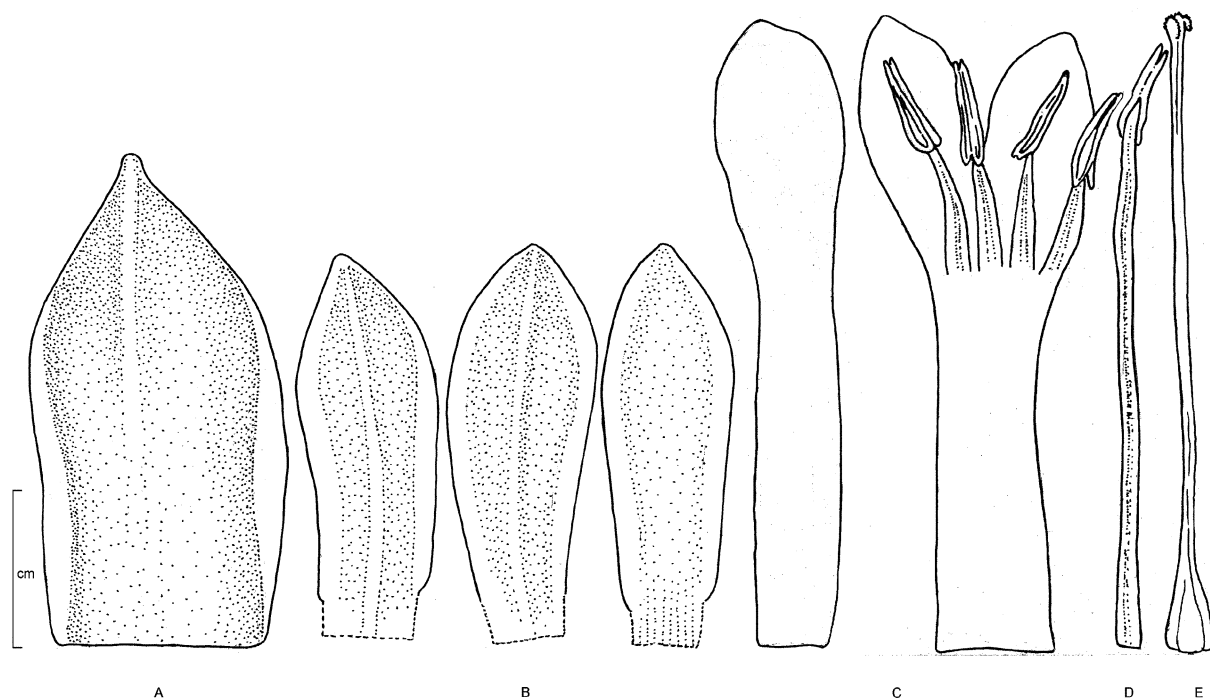


FIGURE 4. Drawing of the flower parts of the type specimen of *Guzmania inkaterrae* A. Floral bract. B. Sepals (abaxial one on the right). C. Petals (the left one separated). D. Stamen E. Pistil.



FIGURE 5. *Guzmania inkaterrae* in habitat **A.** Epiphytic on small trees in the mountain forest. **B.** Inflorescence with flowers. **C.** Plant on a branch, fallen on the forest floor.



FIGURE 6. Fertile part of the inflorescence of *Guzmania inkaterrae* showing some colour variation within the species. More often the inflorescence is more greenish.

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