

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS
FROM THE
UNITED STATES NATIONAL HERBARIUM

VOLUME 29, PART 10

STUDIES IN THE BROMELIACEAE, XVI

By LYMAN B. SMITH



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1951

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM

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PREFACE

THIS paper, by Lyman B. Smith, associate curator of the Department of Botany, U. S. National Herbarium, is the sixteenth of his series of studies of the family Bromeliaceae, the fifteenth having been published as volume 29, part 7, in the "Contributions from the United States National Herbarium." The first part of the paper contains a miscellany of noteworthy records, including 14 new species. The second part is a continuation of a synopsis of the Tillandsieae and includes two new species. All new species are illustrated.

JASON R. SWALLEN,
*Head Curator, Department of Botany,
United States National Museum.*

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STUDIES IN THE BROMELIACEAE, XVI¹

By LYMAN B. SMITH

INTRODUCTION

THE present paper consists of two parts, the first being a miscellany of preliminary records of species for which there is no immediate prospect of inclusion in any floristic or monographic treatment, and the second a continuation of a synopsis of the Tillandsieae.

Thanks are tendered to those in charge of the following herbaria for the opportunity to examine their material: The Bailey Hortorium (Bailey Hort.); the British Museum (Natural History) (BM); the Jardin Botanique de l'État, Brussels (BR); the Dudley Herbarium of Stanford University (DS); the private herbarium of José Pérez Carabia (Carabia); the Chicago Natural History Museum (formerly the Field Museum) (F); the Gray Herbarium of Harvard University (GH); the Herbario Nacional de Colombia, Bogotá (Hb. Nac. Colomb.); the Jenman Herbarium of the Botanic Gardens, Georgetown, British Guiana (Jenman); the Royal Botanic Gardens, Kew (K); the Institut et Jardin Botanique, Liège, Belgium (Liège); the private herbarium of Cyrus Longworth Lundell (Lundell); the University of Michigan (MICH); the Missouri Botanical Garden (MO); the Botanisches Museum, Munich (M); the Museu Nacional, Rio de Janeiro (Mus. Nac. Rio); the New York Botanical Garden (NY); the Muséum d'Histoire Naturelle, Paris (P); Pomona College (POM); the Riksmuseet, Stockholm (S); the Instituto de Botânica, São Paulo, Brazil (SP); the Department of Agriculture, Port-of-Spain, Trinidad (TRIN); the University of California (UC); the United States National Museum (US); the University of Tennessee (U. Tenn.); and the Estacion Experimental Agronómica, Santiago de las Vegas, Cuba (Vegas). Material from other herbaria has been considered on the basis of descriptions and photographs.

PRELIMINARY NOTES

THE miscellaneous records are arranged geographically, since their chief use will be in floristic works. However, one matter of general

¹ Number XV of this series, "Studies in the Bromeliaceae," was published in *Contr. U. S. Nat. Herb.* 29 (7) 1949.

systematic significance is distributed under the various geographic headings, namely the transfer to *Vriesia* of all species of *Tillandsia* with appendaged petals.

Mez's distinction of lateral folds against scales² has served to keep several species in *Tillandsia* where their habit seems more appropriate. The difference, however, is one of proportion only, the lateral fold being simply a scale in which the attached central portion is so long that its lateral free margins are more noticeable than the apical flap. In most of the previously recognized species of *Vriesia* the free apical part of the scale is conspicuous and the attached part relatively short, but intergradations between the two extremes are frequent.

MEXICO

Aechmea matudai L. B. Smith, sp. nov.

FIGURE 37

Planta verisimiliter metralis, a *Ae. sprucei* Mez, cui affinis, pilis inflorescentiae crispatis, floribus subduplo majoribus, sepalis longe spinosis differt.

Probably about a meter high; leaf 6 dm. long, wholly covered by a membrane of pale coalesced scales, sheath conspicuous, nearly as long

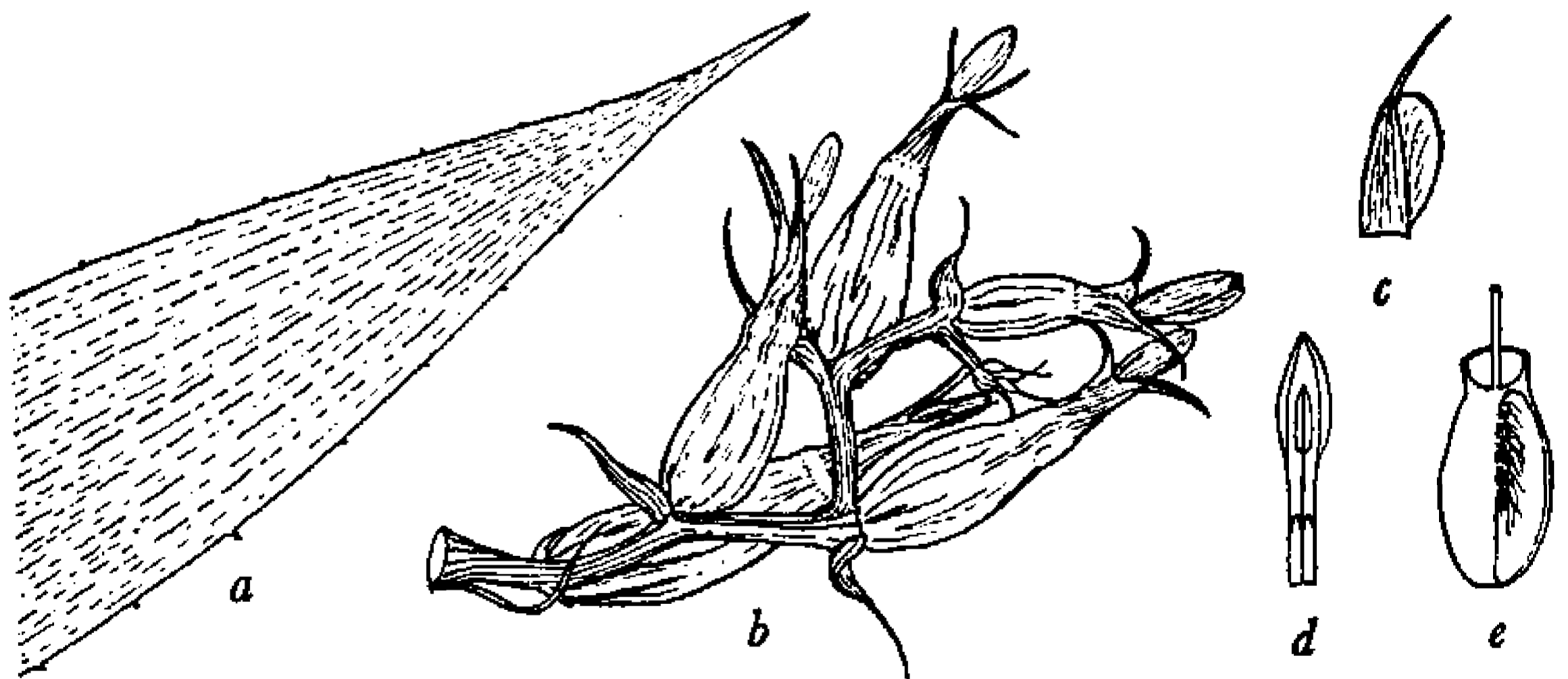


FIGURE 37.—*Aechmea matudai*: a, Apex of scape-bract, $\times 1$; b, branch of inflorescence, $\times 1$; c, sepal, $\times 1$; d, petal, $\times 1$; e, longitudinal section of ovary, $\times 1$.

as the blade, elliptic, blade ligulate, broadly rounded and apiculate, 9.5 cm. wide, subdensely serrate with dark teeth 2 mm. long; scape erect, sulcate, white-flocculose, becoming glabrous; scape-bracts (only the upper ones known) lanceolate, acuminate to a pungent apex, 15–16 cm. long, serrulate, subchartaceous when dry, rose, flocculose at base; inflorescence laxly bipinnate, cylindrical, acuminate, 4 dm. long, 10–12 cm. in diameter, white-flocculose; lowest primary bracts like the scape-bracts, much exceeding the axillary branches, changing abruptly to primary bracts exactly like the floral bracts in size and

² Mez in DC. Monogr. Phan. 9: 634, 783. 1896.

shape; branches spreading, simple, geniculate, slender, 2–4-flowered, often bearing a tuft of sterile bracts at apex; floral bracts narrowly triangular, subulate-acuminate, 8–10 mm. long; flowers sessile, spreading, soon glabrous; sepals nearly free, strongly asymmetric, 10 mm. long exclusive of the 5–7 mm. long mucro; petals 15 mm. long, red-purple when dry, bearing two lacerate scales well above the base; stamens included; ovary ellipsoid, epigynous tube 2 mm. high, ovules long-caudate, borne on the upper half of the axis.

Type in the Chicago Natural History Museum, collected at Esperanza, Escuintla, state of Chiapas, Mexico, November 27, 1947, by E. Matuda (No. 17308).

At first glance *Aechmea matudai* seems to be only a large specimen of *Ae. sprucei* Mez, but its sepals have a mucro proportionately much larger and its inflorescence lacks the simple bristlelike trichomes that are so striking in *Ae. sprucei*. The nearest North American relative of *Ae. matudai* is *Ae. iguana* Wittm., but the latter has an amply tripinnate inflorescence.

The following specimen is certainly conspecific:

MEXICO:

CHIAPAS: Acacoyagua, Sept. 28, 1947, *E. Matuda* 17009 (F).

Hechtia tillandsioides (André) L. B. Smith, comb. nov.

Bakeria tillandsioides André, Rev. Hort. 61: 84, pl. 1889.

Hechtia purpusii Brand. Univ. California Publ. Bot. 7: 325. 1920; L. B. Smith, Contr. Gray Herb. 117: 14. 1937.

Bakerantha tillandsioides L. B. Smith, Contr. Gray Herb. 104: 72. 1934.

TYPE LOCALITY: "Colombia." Type collected by E. André from cultivated material.

DISTRIBUTION: Mexico.

MEXICO: André K386 (K, type). Cultivated, June 1950, *Foster* 2734 (US).

HIDALGO: Alt. 150 m., cultivated and flowered July 1939, *Halbinger* (GH).

VERA CRUZ: On steep rocks, Barranca de Tenampa, 1919, *Purpus* 8420 (♀ UC, type of *Hechtia purpusii* Brandege; GH, US). Paso de la Milpa, Jalapa, 1884, *Com. Geogr. Explor. Rep. Mex.* 224 (♂ F).

Because of the supposed Colombian origin and apparently perfect flowers of the monotypic genus *Bakeria* or *Bakerantha*, its identity with the strictly North American genus *Hechtia* long went unsuspected. Now it is evident that the "Colombia" was just another of those confusions so frequent in the description of novelties from horticultural material. The functional dioecism of the flowers is shown in comparing the large stamens and reduced ovary of *Bakerantha* with the minute stamens and large ovary of the type of *Hechtia purpusii*.

I am indebted to Dr. Ernest Rouleau for a careful comparison of type material of *Bakeria tillandsioides* and *Hechtia purpusii*. According to description, *Bakeria tillandsioides* is supposed to have entire leaves. However, Dr. Rouleau notes that they are serrated but that the margin is often covered with a mucilaginous border, so that on superficialia

examination they appear entire. While this note was in preparation, Mulford B. Foster sent in a freshly flowering specimen from the cultivated stock of *Bakeria*, which I supposed had long ago died out. It fully confirms the above notes in all details.

COLOMBIA

Bakerantha L. B. Smith, Contr. Gray Herb. 104: 72. 1934.

This genus becomes a synonym of *Hechtia*. See under Mexico: *Hechtia tillandsioides* (p. 431).

Pitcairnia calophylla L. B. Smith, sp. nov.

FIGURE 38

A *P. longipede* Mez, *P. spectabili* Mez, et *P. laxissima* Baker quibus affinis, foliorum laminis amplissimis, bracteis florigeris maximis (eis *P. laxissimae* ignotis), pedicellis minoribus differt.

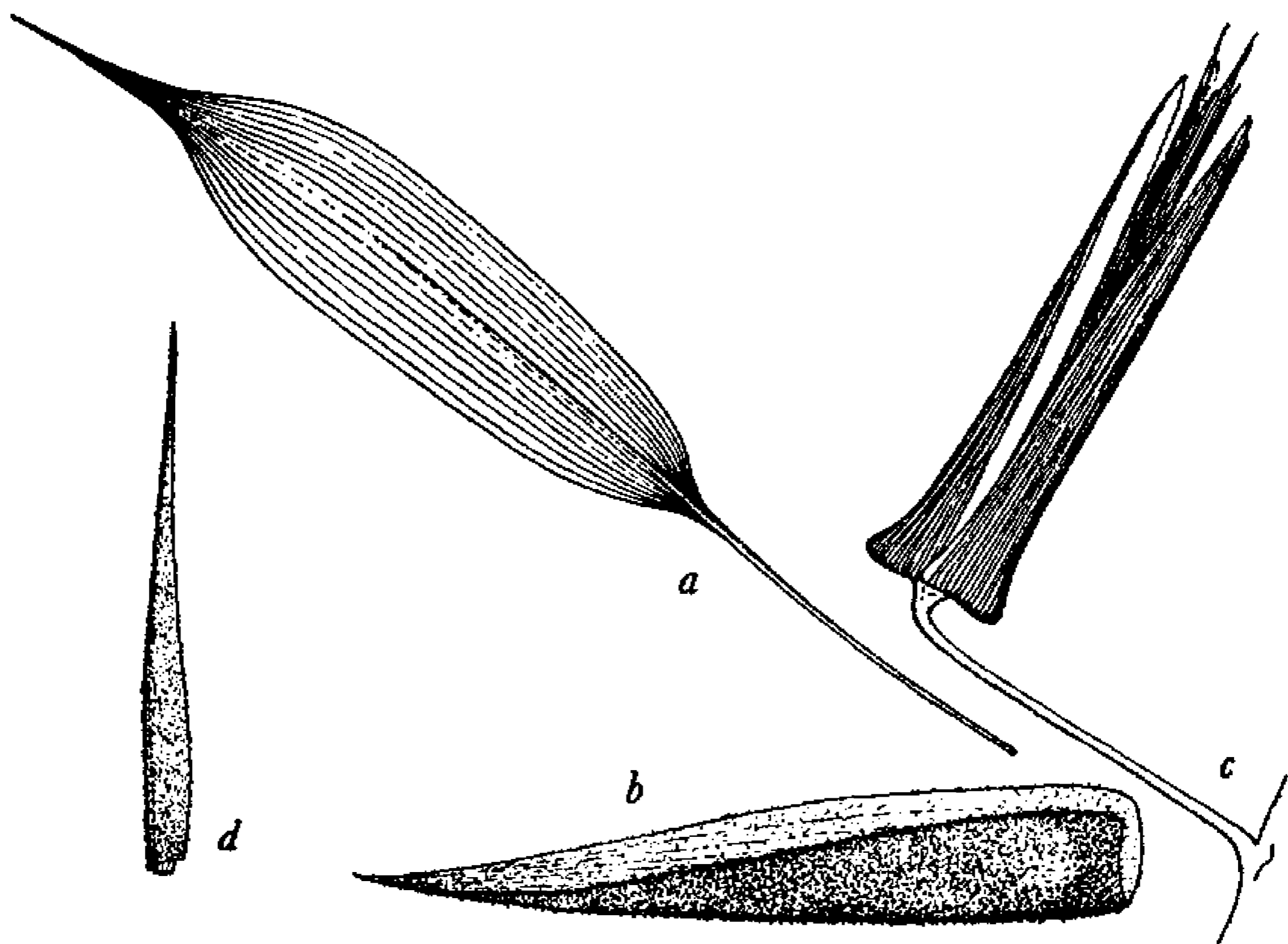


FIGURE 38.—*Pitcairnia calophylla*: a, Leaf, $\times 1/10$; b, floral bract, $\times 1$; c, old flower, $\times 1$; d, young sepal, $\times 1$.

Terrestrial, nearly 2 m. high (! Foster); leaf (only one known) 12 dm. long (! Foster), entire, sheath not seen, petiole slender, elongate, blade oblanceolate, abruptly acuminate, 7 dm. long, 14 cm. wide, channeled in the center, dark green above, deep maroon beneath; scape erect, 1 cm. in diameter; scape-bracts unknown; inflorescence simple, lax, elongate; floral bracts lance-ovate, acute, 65 mm. long, exceeding the pedicels, entire, thin, densely ferruginous-flocculose; pedicels spreading, slender, to 35 mm. long; flowers erect, at right

angles to the pedicels; sepals narrowly lanceolate, acuminate, 47 mm. long, carinate toward base, densely ferruginous-flocculose; ovary four-fifths superior.

Type in the Gray Herbarium, collected above El Diviso, Department of Nariño, Colombia, altitude 705 meters, November 13, 1946, by M. B. and R. Foster (No. 2159).

Unfortunately *Pitcairnia calophylla* was discovered when only extremely young and old inflorescences were available. However, such characters as can be ascertained mark the species as most unusual. The leaves, which are reminiscent of certain Marantaceae, are among the most striking and handsome in *Pitcairnia*.

Pitcairnia petraea L. B. Smith, sp. nov.

FIGURE 39

A *P. guaritermae* André, cui affinis, statura triplo maiore, sepalis minoribus, apiculatis, petalis viridi-albis differt.

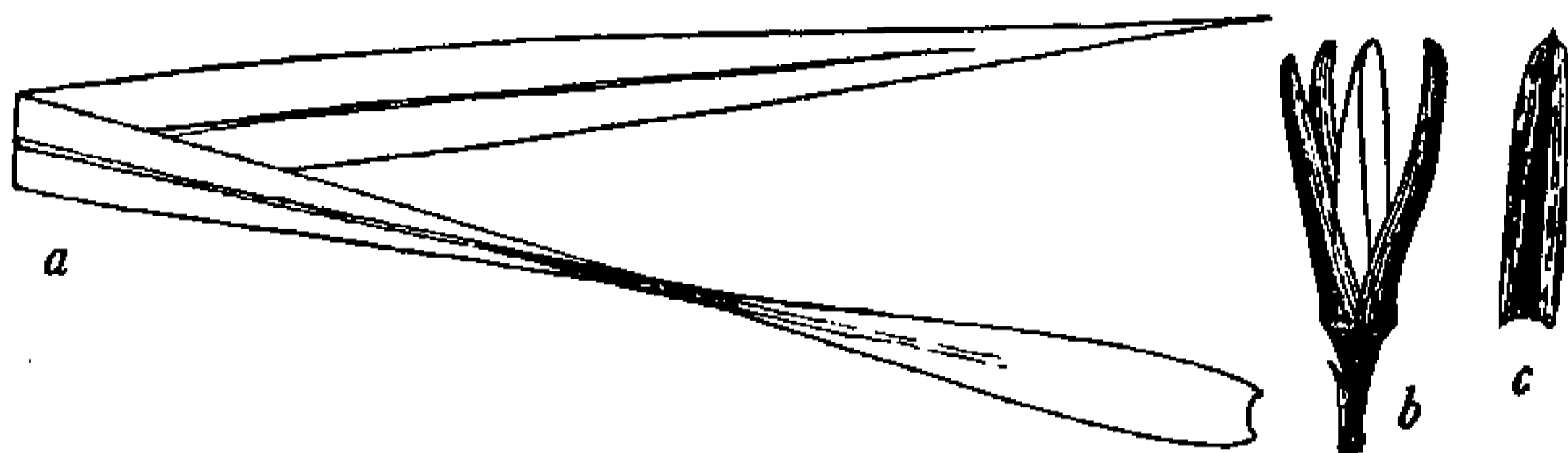


FIGURE 39.—*Pitcairnia petraea*: a, Leaf, $\times 1/10$; b, floral bract and flower, $\times 1$; c, sepal, $\times 1$.

Flowering plant over 2 m. high; leaves all alike, 1.5 m. long, entire, narrowed between sheath and blade but not petiolate, sheaths narrowly triangular, elongate, densely brown-flocculose when young, blades linear-lanceolate, acuminate, to 5 cm. wide (! Foster), brown-flocculose beneath, becoming glabrous; scape erect, about 1 cm. in diameter; scape-bracts subfoliaceous, the lower imbricate, the upper remote; inflorescence simple, subdense, many-flowered, 20–25 cm. long (! Foster); floral bracts narrowly triangular, about equaling the lower pedicels; flowers spreading; pedicels slender, up to 9 mm. long in fruit; sepals oblong, rounded-apiculate, ecarinate, 15 mm. long, nerved, glabrous, green (! Foster); petals at least 2 cm. long, greenish white (! Foster); stamens included; ovary two-thirds superior; fruit dehiscent; seeds long-caudate.

Type in the Gray Herbarium, collected on rocks at the Paramo de San Miguel, Department of Cundinamarca, Colombia, altitude 3,300 meters, October 12, 1946, by M. B. and R. Foster (No. 1877).

The above description was drawn from a nearly complete but very old specimen plus several quite young individual flowers.

Pitcairnia similis L. B. Smith, sp. nov.

FIGURE 40

Inflorescentia cum ea *Pitcairnia multiflorae* L. B. Smith persimilis sed foliis basi valde serratis et foliorum laminis lineari-lanceolatis differt.

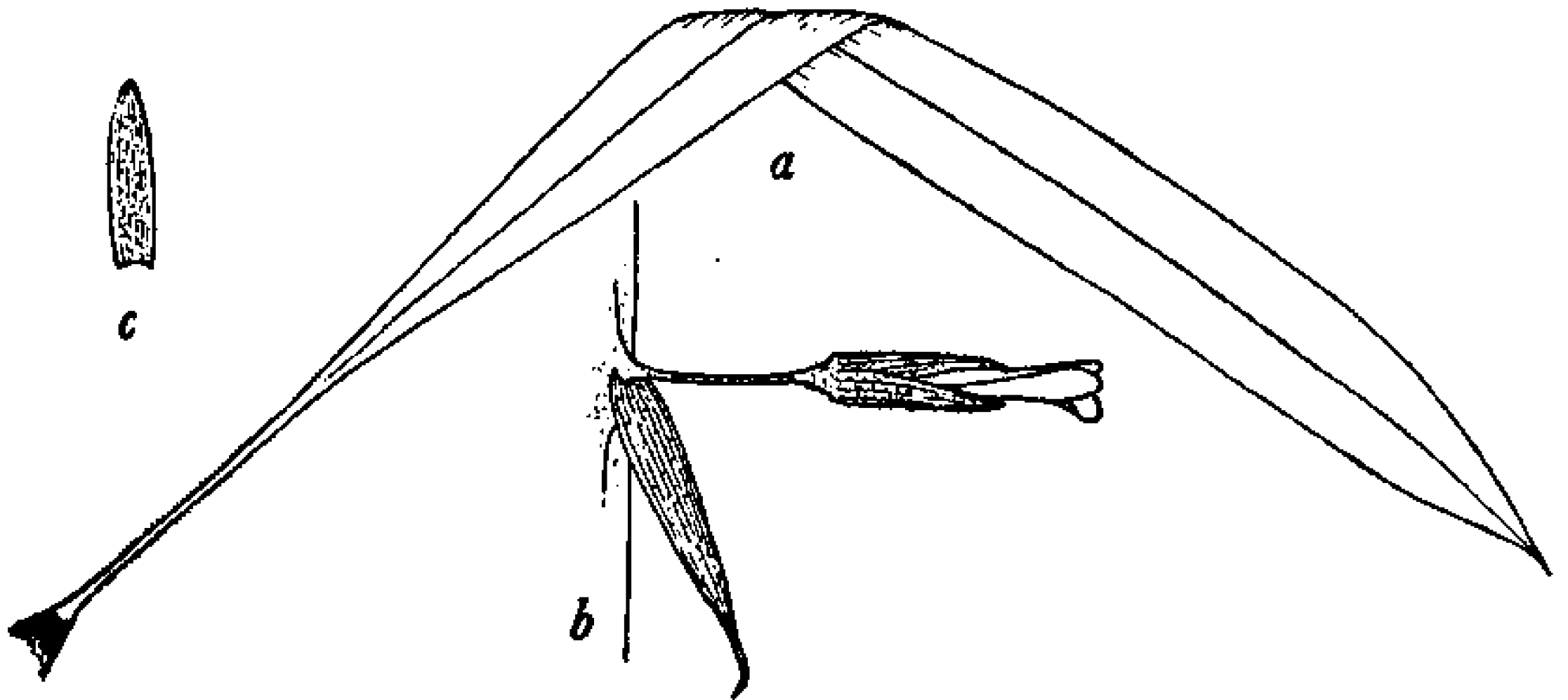


FIGURE 40.—*Pitcairnia similis*: a, Leaf, $\times 1/10$; b, floral bract and flower, $\times 1$; c, sepal, $\times 1$.

Terrestrial, aggregated; leaf (only one known) petiolate, 1.3 m. long, sheath small, dark castaneous, petiole stout, elongate, subdensely serrate with dark uncinatate spines 2–3 mm. long, covered with a pale brown membrane of coalesced scales, blade linear-lanceolate, acuminate, cuneate, 9 cm. wide; scape erect, 15 mm. in diameter at base; scape-bracts imbricate, the lowest subfoliaceous but entire, the others lanceolate, acute or acuminate, closely enfolding the scape, thin, glabrous; inflorescence erect, simple, slenderly cylindric, 5 dm. long, subdense, many-flowered, bearing a small coma of sterile bracts at apex, sparsely pale-flocculose; floral bracts reflexed, narrowly lanceolate, acuminate, membranaceous, red, longer than the pedicels; flowers spreading, pale yellow (! Cuatrecasas); pedicels very slender, 11 mm. long; sepals lance-oblong, acute, 12 mm. long; petals 17 mm. long, naked; stamens included; ovary four-fifths superior; ovules caudate.

Type in the Gray Herbarium, collected at Monte La Guarida, crest of the Cordillera Occidental above La Carbonera (between Las Brisas and Albán), Department of El Valle, Colombia, altitude 1,950–2,000 meters, October 18, 1946, by J. Cuatrecasas (No. 22262).

Tillandsia acuminata L. B. Smith, sp. nov.

FIGURE 41

A *T. rubella* Baker, cui affinis, foliis majoribus, ad apicem versus acuminatis, inflorescentia ample tripinnatim paniculata, bracteis florigeris laevibus differt.

Epiphytic, 1.5–2 m. tall (! Foster), presumably stemless; leaves 7.5–10 dm. long, obscurely punctulate-lepidote; sheaths elliptic; blades ligulate, acuminate, flat, 55 mm. wide; scape erect; scape-bracts imbricate, coiling-recurved toward their apices (! Foster);



FIGURE 41.—*Tillandsia acuminata*: *a*, Apex of leaf, $\times 1/2$; *b*, branch of inflorescence, $\times 1/2$; *c*, posterior sepals, $\times 1$. *Tillandsia arcuans*: *d*, Habit, $\times 1/10$; *e*, sepal, $\times 1$.

inflorescence thyrsoid, amply tripinnate throughout, nearly glabrous; primary bracts elliptic, barely exceeding the sterile bases of the branches; branches ascending, bearing several small sterile bracts at base and a digitate cluster of 5–7 spikes at apex; spikes strict, lance-oblong, acute, 5–7 cm. long, 15 mm. wide, strongly complanate, densely 8–13-flowered; floral bracts distichous, broadly elliptic, acute, carinate, 17 mm. long, equaling or exceeding the sepals, coriaceous, even, sublustrous, castaneous with buff margins when dry; pedicels short and stout; sepals ovate, 13–15 mm. long, free, coriaceous, even, the posterior ones carinate; petals and stamens unknown; capsule cylindrical, acute, about 3 cm. long.

Type in the Gray Herbarium, collected in rain-forest in the mountains above Hacienda Cincinnati, Santa Marta, Department of Magdalena, Colombia, altitude 2,100 meters, August 3, 1946, by M. B. and R. Foster and E. Smith (No. 1402).

ADDITIONAL SPECIMEN EXAMINED:

COLOMBIA:

MAGDALENA: Dense rain-forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 2,100 m., Aug. 3, 1946, M. B. & R. Foster & E. Smith 1406 (GH).

The inflorescence of *Tillandsia acuminata* resembles that of *T. rubella* Baker of Bolivia, but is more richly branched. Heretofore

the inflorescence of *T. rubella* has been described as bipinnate but it is definitely tripinnate in well-developed specimens, including some in the type collection.

***Tillandsia arcuans* L. B. Smith, sp. nov.**

FIGURE 41

A *T. lajense* André, cui affinis, inflorescentia densa, spicis oblongis, longioribus differt.

Stemless, 6–8 dm. high with the inflorescence extended; leaves numerous in a crateriform rosette, over 5 dm. long, covered with appressed cinereous brown-centered scales; sheaths elliptic, 25 cm. long, 10 cm. wide, deep maroon (! Foster); blades narrowly triangular, acuminate, flat, 5 cm. wide, green; scape arching-decurved, 15 mm. thick; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic, deep maroon, bearing a short acuminate recurved green blade; inflorescence few-branched, compact; primary bracts like the upper scape-bracts, many times shorter than the axillary spikes; spikes secund-pendulous, lance-oblong, acute, strongly complanate, 17 cm. long, 4–5 cm. wide, densely 13–17-flowered; floral bracts imbricate, broadly elliptic, acute, 4 cm. long, exceeding the sepals, carinate, coriaceous, glabrous, lustrous, yellow-green with maroon-red margins (! Foster); pedicels stout, 4 mm. long; sepals elliptic, 32 mm. long, free, carinate, thin-coriaceous, sparsely lepidote; petals 6 cm. long, the blade deep purple (! Foster); stamens included.

Type in the Gray Herbarium, collected on perpendicular rocks of El Cañon de Naciento del Diablo, below El Espinal, Department of Nariño, Colombia, altitude 2,100 meters, November 29, 1946, by M. B. and R. Foster (No. 2266).

There is little doubt that *Tillandsia arcuans* is closely related to *T. lajensis* André. As both are represented by single collections, only further material can determine whether it is specifically distinct or merely a variety of *T. lajensis*.

***Tillandsia brevior* L. B. Smith, sp. nov.**

FIGURE 42

A *T. incurva* Grisebach, cui in habitu valde similis, bracteis florigeris carinatis, quam sepalis valde brevioribus differt.

Stemless, 6 dm. long with the inflorescence extended; leaves many in a globose rosette, 45 cm. long, very densely appressed-lepidote throughout, sheaths large, distinct, oblong-elliptic, dark castaneous, blades narrowly triangular, long-acuminate, flat, 35 mm. wide, cinereous-lepidote; scape decurved, slender, very dark brown, glabrous; scape-bracts imbricate, elliptic, densely cinereous-lepidote, the lowest with foliaceous blades, the others apiculate; inflorescence subdigitate from a few spikes; primary bracts like the upper scape-bracts, erect, much shorter than the sterile bases of the spikes; spikes strict, linear with several imbricate sterile bracts at the base, broadly acute, the lateral 12–13 cm., the terminal 18 cm., long, strongly com-

planate, densely 12–16-flowered; rhachis flexuous, strongly angled, excavated next the flowers; floral bracts erect, 18 mm. long, much exceeded by the sepals, ovate, acute, carinate, even, glabrous at least in age; pedicels stout, obconic, 4 mm. long; sepals lanceolate, 20 mm. long, ecarinate, even, glabrous; petals, stamens, and style not known.

Type in the Gray Herbarium, collected in the vicinity of Santa Marta, Department of Magdalena, Colombia, in 1946, by M. B. and R. Foster. Number and exact locality data lost.



FIGURE 42.—*Tillandsia brevior*: *a*, Old scape and inflorescence, $\times 1/5$; *b*, apex of spike, $\times 1$; *c*, sepal, $\times 1$. *Tillandsia chartacea*: *d*, Apex of scape and inflorescence, $\times 1/2$; *e*, sepal, $\times 1$.

Tillandsia chartacea L. B. Smith, sp. nov.

FIGURE 42

A *T. incarnata* H. B. K., cui affinis, scapo validiore, foliis valde majoribus, inflorescentia ramosa differt.

Short-caulescent, flowering plant nearly 1 m. high; leaves 35 cm. long; sheaths elliptic, about 8 cm. long, covered with brown appressed scales; blades narrowly triangular, caudate-acuminate, 3 cm. wide, covered with appressed cinereous scales with brown centers, somewhat plicate; scape erect, elongate, 6 mm. thick, glabrous; scape-

bracts strict, densely imbricate and closely enfolding the scape, the lower foliaceous, the upper broadly elliptic, long-caudate, red; inflorescence few-branched, subdigitate; primary bracts like the upper scape-bracts but merely apiculate, very much shorter than the axillary spikes; spikes suberect, linear, strongly complanate, 11–13 cm. long, 15–20 mm. wide, densely 10–17-flowered; floral bracts elliptic, obtuse, ecarinate, 28 mm. long, exceeding the sepals, chartaceous, nerved, subdensely lepidote with cinereous brown-centered appressed scales; pedicels short and stout; sepals linear-lanceolate, 22 mm. long, more or less nerved, much connate posteriorly, lepidote; petals linear, obtuse, white with dark pink blade (! Foster); stamens included, the filaments plicate near the apex.

Type in the Gray Herbarium, collected on rocks at Suesca, Department of Cundinamarca, Colombia, altitude 2,580 meters, October 9, 1946, by M. B. and R. Foster (No. 1802).

Its plicate filaments indicate that *Tillandsia chartacea* is probably most closely related to *T. incarnata* H. B. K., and the leaves, spikes, and floral bracts are also similar although much larger. These two species would be widely separated in Mez's system since he makes a major division on the highly artificial character of the amount of branching of the inflorescence.

Tillandsia fusiformis L. B. Smith, sp. nov.

FIGURE 43

A *T. sceptriforme* Mez et Sodiro, cui affinis, statura parva, laminis bractearum primarium strictis, sepalis acutis differt.

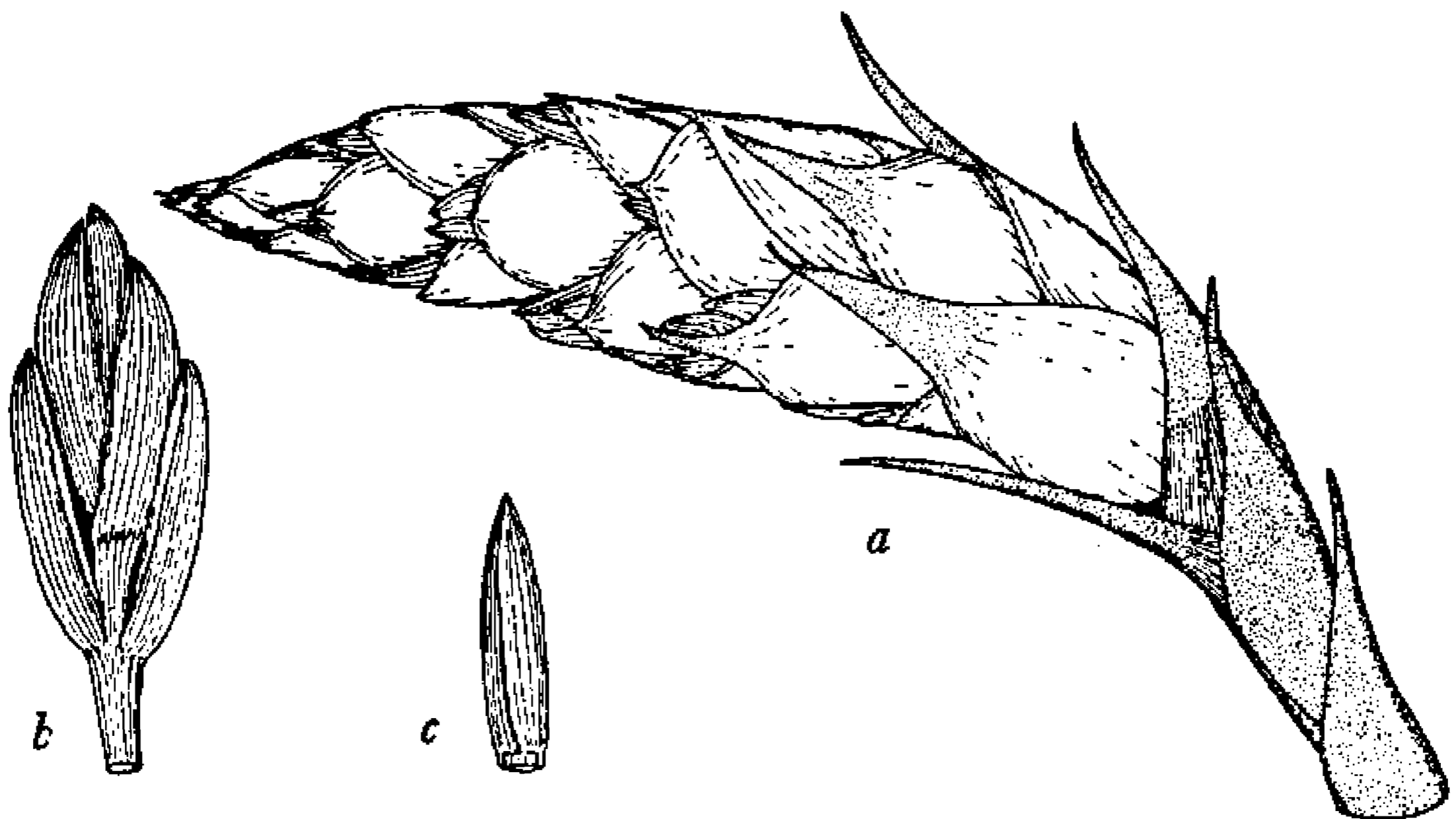


FIGURE 43.—*Tillandsia fusiformis*: *a*, Apex of scape and inflorescence, $\times 1/2$; *b*, spike, $\times 1$; *c*, sepals, $\times 1$.

Stemless, 5 dm. high with the inflorescence extended; leaves 3–4 dm. long, covered with appressed cinereous brown-centered scales; sheaths elliptic, 1–2 dm. long, dark purple; blades ligulate, acute to

acuminate, 4 cm. wide; scape curved, largely concealed by the leaves; scape-bracts foliaceous, erect, densely imbricate; inflorescence densely bipinnate, fusiform, 15 cm. long, 3.5 cm. in diameter; primary bracts orbicular, obscurely punctulate-lepidote, lustrous, probably red in life, the lower ones exceeding to slightly shorter than the axillary spikes and bearing narrowly triangular densely lepidote blades; spikes short-stipitate without any sterile bracts, lanceolate, 3–4 cm. long, densely 5-flowered, strongly complanate; floral bracts imbricate, lance-oblong, acute, carinate, 20–24 mm. long, equaling the sepals, sub-chartaceous, strongly nerved, glabrous; pedicels very short and stout; sepals subfree, lanceolate, carinate, chartaceous, glabrous; petals 3 cm. long, the claw linear, white, the blade oblanceolate, obtuse, purple (! Foster); stamens included, the filaments joined in a tube (! Foster).

Type in the Gray Herbarium, collected on trees and rocks, at La Cabana near Pepino, Territory of Putumayo, Colombia, altitude 1,200 meters, November 21, 1946, by M. B. and R. Foster (No. 1970a=2341).

This species is founded on two plants from what is almost certainly the same collection, although one came numbered 1970 and the other 2341. A check of the field labels discloses that 1970 has already been applied correctly to another species, so the first plant of *Tillandsia fusiformis* becomes number 1970a. It is chosen as the type because its inflorescence is in good condition while that of plant number 2341 is very immature. The locality data necessarily come from 2341, as do the data on petals and stamens shown by a colored field sketch.

Tillandsia racinae L. B. Smith, sp. nov.

FIGURE 44

T. fasciculata Swartz atque *T. dugesii* Baker in systema Mezii proxima sed vix affinis, spicis maxime elongatis, subteretibus, plurifloris, bracteis florigeris sepalsisque ecarinatis differt.

Stemless, flowering plant 9–12 dm. long with the inflorescence extended; leaves numerous in a crateriform rosette, over 1 m. long, covered with appressed scales; sheaths broadly elliptic, distinct, 2 dm. long, dark castaneous-lepidote; blades narrowly triangular, acuminate, 4 cm. wide, cinereous-lepidote; scape curved, very stout, glabrous; scape-bracts foliaceous, erect, densely imbricate; inflorescence laxly bipinnate, glabrous; primary bracts broadly ovate, acute, shorter than the sterile bases of the axillary spikes; spikes arching-decurved, linear, subterete, 9 dm. long, 2 cm. wide at anthesis, dense, about 50-flowered with the apical flowers blooming after the basal ones have formed mature capsules (! Foster), bearing a few sterile bracts at the base; floral bracts broadly elliptic, obtuse, ecarinate, 5 cm. long, coriaceous, even centrally, nerved by margins and apex, stramineous; sepals free, symmetrical, narrowly oblanceolate,

obtuse, 30 mm. long, ecarinate, coriaceous, nerved by margins and apex; petals 5 cm. long, lavender (! Foster); stamens exserted.

Type in the Gray Herbarium, collected on cliffs, Río Icononzo, Department of Tolima, Colombia, altitude 900 meters, October 13, 1946, by M. B. and R. Foster (No. 1885).

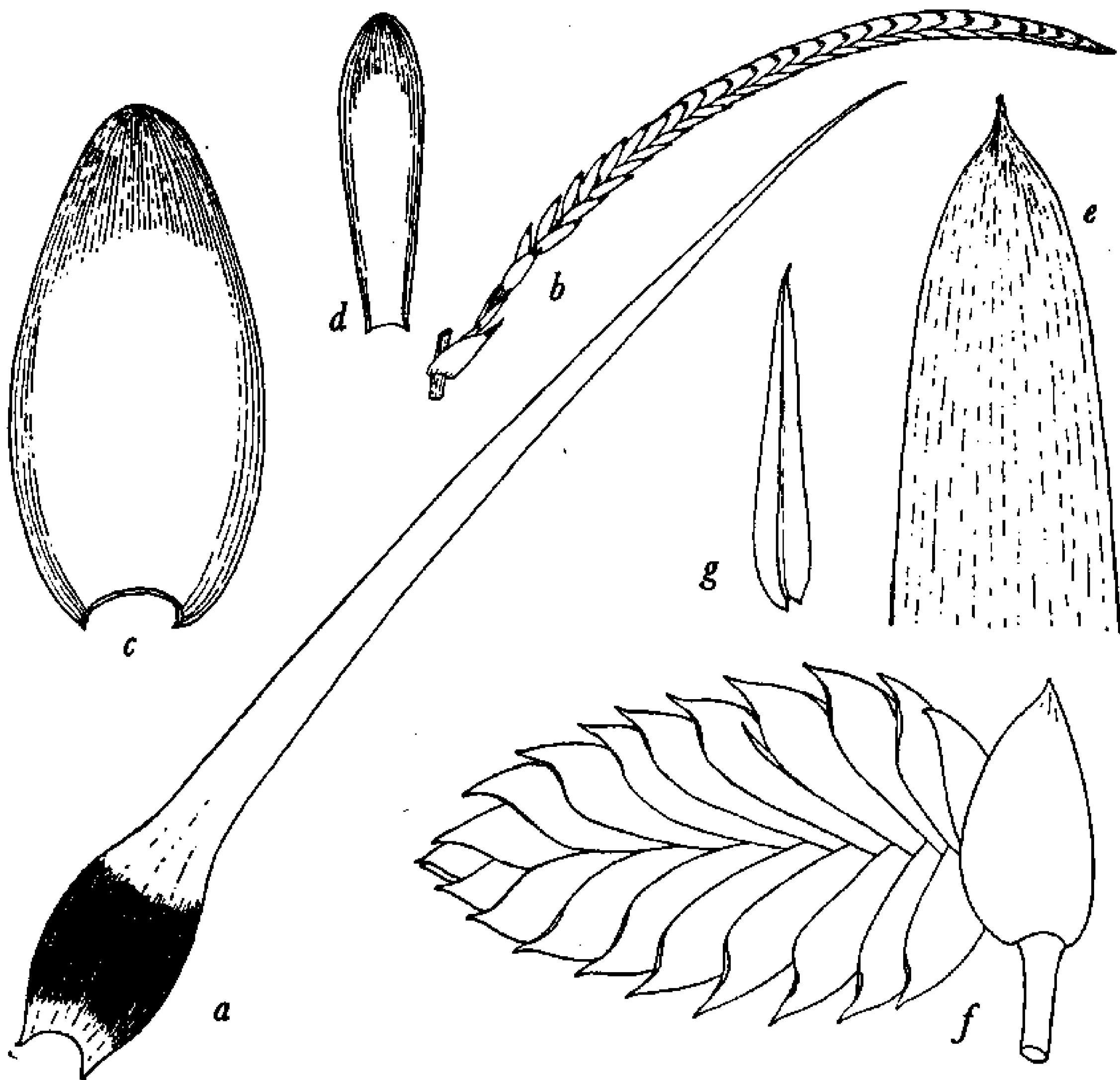


FIGURE 44.—*Tillandsia racinae*: *a*, Leaf, $\times 1/10$; *b*, primary bract and spike, $\times 1/10$; *c*, floral bract, $\times 1$; *d*, sepal, $\times 1$. *Tillandsia sigmoidea*: *e*, Apex of leaf, $\times 1/2$; *f*, primary bract and spike, $\times 1/2$; *g*, sepal, $\times 1$.

Tillandsia sigmoidea L. B. Smith, sp. nov.

FIGURE 44

A *T. brevilingua* Mez, cui aegre affinis, omnibus partibus multo majoribus, foliis acutis, scapi bracteis dense imbricatis, bracteis florigeris laevibus, margine prope apicem valde sigmoideo-curvatis, sepalis liberis differt.

Stemless, 1 m. tall; leaves 30–45 cm. long, obscurely brown-lepidote; sheaths elliptic, ample, nearly as long as the blades and scarcely distinct, brown or purple; blades ligulate, acute, 5–8 cm. wide, often purple-spotted; scape erect, stout; scape-bracts erect, densely imbricate, the upper ones broadly elliptic, acute; inflorescence subdensely bipinnate, globose, 25 cm. long, essentially glabrous, sublustrous;

primary bracts broadly ovate, acute, much shorter than the axillary spikes; spikes spreading, lance-ovate, acute, strongly complanate, 12 cm. long, 6 cm. wide, very densely 20–22-flowered; floral bracts broadly obovate with the margins sigmoid-curved just below the acuminate apex, 40–45 mm. long, exceeding the sepals, alate-carinate, coriaceous, even, red; pedicels broadly obconical, 2 mm. long; sepals lanceolate, acute, 30 mm. long, free, subcoriaceous, lepidote inside, the posterior ones carinate; petals purple (! Foster); capsule shorter than the floral bracts.

Type in the Gray Herbarium, collected in the last line of trees on the mountain-side, Aduriameina, Sierra Nevada de Santa Marta, Department of Magdalena, Colombia, altitude, 3,060 meters, August 19, 1946, by M. B. and R. Foster and E. Smith (No. 1461). Duplicate in U. S. National Herbarium.

In the key in the *Pflanzenreich*, *Tillandsia sigmoidea* would fall next to *T. brevilingua* Mez of Peru, but the various differences, especially that of sepal-fusion, make it seem unlikely that there is any very close relationship between the two species.

Tillandsia suescana L. B. Smith, sp. nov.

FIGURE 45

T. archeri L. B. Smith atque *T. turneri* Baker affinis, a priore partibus majoribus, spicis suberectis, densis, a posteriore bracteis primariis brevibus, sepalis majoribus, acutioribus, a ambobus inflorescentia pauciramosa, bracteis florigeris laevibus distinguenda.

Stemless, 4–6 dm. tall; leaves numerous in a crateriform rosette, 3–4 dm. long; sheaths elliptic, 15 cm. long, brown, punctulate-lepidote; blades narrowly triangular, acuminate, flat, 3–4 cm. wide, green and sparsely appressed-lepidote above, beneath covered with cinereous appressed scales; scape erect or ascending, much shorter than the leaves; scape-bracts erect, densely imbricate, the lower foliaceous, the upper elliptic with caudate cinereous-lepidote apices, faintly striate, subglabrous; inflorescence few-branched, digitate; primary bracts like the upper scape-bracts, only about half as long as the axillary spikes; spikes suberect, sessile, lanceolate, acute, strongly complanate, 7–9 cm. long, 22 mm. wide, densely 8–13-flowered; floral bracts elliptic, cucullate, equaling the sepals, carinate, coriaceous, even, nearly glabrous, orange-yellow (! Foster); pedicels obconical, 3 mm. long; sepals linear-lanceolate, acute, 28 mm. long, much connate posteriorly, coriaceous; petals linear, obtuse, about 5 mm. longer than the sepals, white with pink blade (! Foster); stamens included.

Type in the Gray Herbarium, collected on rocks and trees, Suesca, Department of Cundinamarca, Colombia, altitude 2,580 meters, October 9, 1946, by M. B. and R. Foster (No. 1801).

On account of its short primary bracts *Tillandsia suescana* would fall next to *T. archeri* L. B. Smith in Mez's system, but on most other counts it more nearly resembles *T. turneri* Baker.

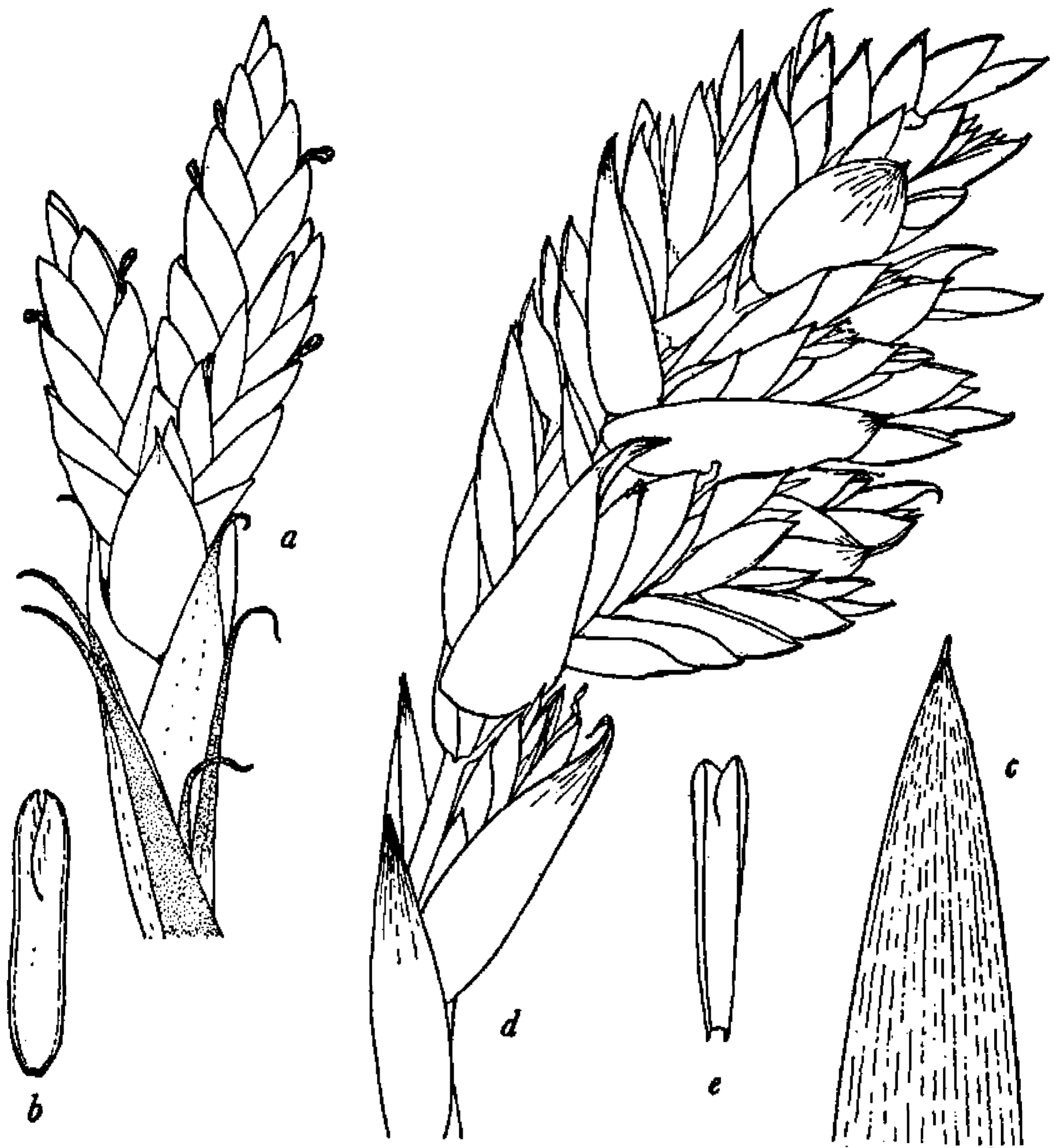


FIGURE 45.—*Tillandsia suescana*: *a*, Apex of scape and inflorescence, $\times 1/2$; *b*, posterior sepals, $\times 1$. *Tillandsia ultima*: *c*, Apex of leaf, $\times 1/2$; *d*, apex of scape and inflorescence, $\times 1/2$; *e*, posterior sepals, $\times 1$.

Tillandsia ultima L. B. Smith, sp. nov.

FIGURE 45

A *T. compacta* Grisebach, cui affinis, omnibus partibus majoribus, foliis valde acutioribus differt.

Plant about 8 dm. long with the inflorescence extended; leaves 4–5 dm. long, obscurely brown-lepidote; sheaths elliptic, ample, 15–18 cm. long, dark purple with light streaks at the base; blades ligulate, acute to acuminate, 4 cm. wide, maroon-spotted; scape curved, stout; scape-bracts erect, densely imbricate, the lower foliaceous, the upper elliptic, acuminate, red; inflorescence densely bipinnate, ellipsoid, 23 cm. long, 9 cm. in diameter, red, very sparsely and obscurely lepidote,

sublustrous; lower primary bracts like the upper scape-bracts, equaling or slightly exceeding the axillary spikes, the upper broadly rounded and apiculate, much shorter than the spikes; spikes strict, subsessile, lanceolate, acute, 8 cm. long, 3 cm. wide, strongly complanate, densely 4-7-flowered; floral bracts elliptic, acute, 35 mm. long, much exceeding the sepals, sharply carinate, coriaceous, even; pedicels 2 mm. long; sepals oblanceolate, obtuse, 25 mm. long, carinate, coriaceous, even, posteriorly connate for more than half their length; petals and stamens not known; capsule prismatic, slenderly stipitate, acuminate, barely exerted from the floral bracts.

Type in the Gray Herbarium, collected in the last line of trees on the mountain-side above Aduriameina, Sierra Nevada de Santa Marta, Department of Magdalena, Colombia, altitude 3,000 meters, August 19, 1946, by M. B. and R. Foster and E. Smith (No. 1460). Duplicate in U. S. National Herbarium.

Because of its size, *Tillandsia ultima* would appear to be related to *T. brunonis* André according to the key in the Pflanzenreich, but in both habit and the form of its parts it is much more like *T. compacta* Grisebach of Venezuela and the West Indies. The specific name alludes to the plant's location in the last line of trees on the mountain.

Vriesia cylindrica L. B. Smith—cf. under Ecuador (p. 445).

Vriesia fragrans (André) L. B. Smith, comb. nov.

Tillandsia fragrans André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hort. 60: 567. Dec. 16, 1888; Brom. Andr. 83, pl. 29, fig. A. 1889.

TYPE LOCALITY: Quebrada de Las Juntas, "Ecuador." Type collected by André (No. 4397).

DISTRIBUTION: Colombia.

COLOMBIA:

CUNDINAMARCA: Tocaima, Dec. 1932, Pérez Arbelaez 2593 (US). In trees, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, M. B. & R. Foster 1880 (GH, US).

EL VALLE: Quebrada de Las Juntas, alt. 2,500 m., 1876, André 4397 (K, type).

The only "Las Juntas" noted by André in the account of his travels in the journal "Le Tour du Monde," is in Colombia near the Río Dagua. The Foster specimen shows two scales on the petal and these are connate for about nine-tenths of their length.

Vriesia heterandra (André) L. B. Smith, comb. nov.

Tillandsia heterandra André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hort. 60: 567. Dec. 16, 1888; Brom. Andr. 83, pl. 27. 1889.

TYPE LOCALITY: Puente de Quetame, Andes of Bogotá, Department of Cundinamarca, Colombia. Type collected by André (No. 1213).

DISTRIBUTION: Colombia, Bolivia.

COLOMBIA:

NORTE DE SANTANDER: In trees, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, M. B. & R. Foster 1695 (GH, US).

SANTANDER: Woods, vicinity of California, alt. 2,200 m., Jan. 11-27, 1927, Killip & Smith 17115 (GH).

CUNDINAMARCA: Puente de Quetame, Andes of Bogotá, alt. 1,975 m., Jan. 1876, *André* 1213 (K, type).

BOLIVIA:

LA PAZ: Larecaja: Hacienda Casana on the road to Tipuani, alt. 1,400 m., 1922, *Buchtien* 7184 (US).

Transfer of this species to *Vriesia* is made on the basis of André's description and illustration, none of the other cited material having sufficiently well preserved petals.

Vriesia pereziana (André) L. B. Smith, comb. nov.

Tillandsia pereziana André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hort. 60: 567. Dec. 16, 1888; Brom. Andr. 80, pl. 28. 1889.

TYPE LOCALITY: Río Funza, near Tequendama Falls, Department of Cundinamarca, Colombia. Type collected by André (No. 1348).

DISTRIBUTION: Vicinity of the type locality.

COLOMBIA:

CUNDINAMARCA: On small trees hanging above the rocks of the Río Funza near Tequendama Falls, alt. 2,550 m., Feb. 1876, *André* 1348 (K, type).

On rocks and small trees, Salto de Tequendama, alt. 2,100 m., Oct. 16, 1946, *M. B. & R. Foster* 1907 (GH, US).

Both André's illustration and the Foster material show two large conspicuous scales on the petal.

Vriesia tequendamae (André) L. B. Smith, comb. nov.

Tillandsia tequendamae André, Énum. Bromél. 8. Dec. 13, 1888; Rev. Hort. 60: 568. Dec. 16, 1888; Brom. Andr. 103, pl. 36. 1889.

TYPE LOCALITY: Falls of Tequendama, Department of Cundinamarca, Colombia. Type collected by André (No. 1355).

DISTRIBUTION: Colombia.

COLOMBIA:

MAGDALENA: In high trees, above Pueblo Bello, Sierra Nevada de Santa Marta, alt. 1,200 m., Aug. 16, 1946, *M. B. & R. Foster & E. Smith* 1453 (GH)

NORTE DE SANTANDER: Epiphyte, woods along stream, Culagá Valley, near Tapatá (north of Toledo), alt. 1,500–2,100 m., Mar. 3–8, 1927, *Killip & Smith* 20177 (GH, US).

CUNDINAMARCA: On rocks near the Falls of Tequendama, alt. 2,500 m., Feb. 1876, *André* 1355 (K, type). San Cristóbal, July 1917, *Ariste-Joseph* A112 (US). Quebrada de Chico, Macizo de Bogotá, alt. 2,650–2,750 m., June 1, 1939, *Cuatrecasas* 5253 (Hb. Nac. Colomb.). In small trees, cold dry windy areas, El Chico above Bogotá, alt. 3,000 m., Oct. 11, 1946, *M. B. & R. Foster* 1840 (GH).

PUTUMAYO: On trees, San Francisco, alt. 2,100 m., Nov. 26, 1946, *M. B. & R. Foster* 2264 (GH).

ANTIOQUIA: Epiphyte, moist open woods, on the road to Boquerón de San Cristóbal, alt. ca. 2,500 m., June 2, 1948, *Barkley, Durán, & Correa* 100 (US).

CAUCA: Epiphyte, forest, "Canaan," Mount Purace, Cordillera Central, alt. 3,100–3,300 m., June 11–16, 1922, *Killip* 6698 (GH). In virgin forest, vicinity of El Tambo, Munchique, alt. 2,000 m., June 13, 1936, *Sneidern* 735 (S).

The Killip and Smith material shows the same conspicuous scales on the petals that André illustrated.

ECUADOR

Vriesia appendiculata (L. B. Smith) L. B. Smith, comb. nov.

Tillandsia appendiculata L. B. Smith, *Lloydia* 11: 307, fig. 6. 1949.

TYPE LOCALITY: Around Tambo Cachiyacu, along Río Cachiyacu, Province of Loja, Ecuador. Type collected by Julian A. Steyermark (No. 54780).

DISTRIBUTION: Province of Loja, Ecuador.

ECUADOR:

LOJA: On tree, western slopes of Cordillera de Condor, and northwestern slopes of Nudo de Sabanillas, around Tambo Cachiyacu, along Río Cachiyacu, about 2 leagues southeast of Yangana, alt. 2,000–3,000 m., Oct. 19, 1943, *Steyermark* 54780 (GH, type; F). Cajanuma, alt. 2,400 m., May 7, 1946, *R. Espinosa* E-353 (GH).

Vriesia arpocalyx (André) L. B. Smith, comb. nov.

Tillandsia arpocalyx André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hort.* 60: 567. Dec. 16, 1888; *Brom. Andr.* 101, pl. 38. 1889.

TYPE LOCALITY: South of Riobamba, Province of Chimborazo, Ecuador. Type collected by André (No. 4474).

DISTRIBUTION: Ecuador.

ECUADOR:

TUNGURAHUA: Dry hills between Baños and Ambato, alt. 1,800 m., Sept. 26, 1923, *Hitchcock* 21906 (GH, US).

CHIMBORAZO: Mountains, south of Riobamba, alt. 2,500 m., July 1876, *André* 4474 (K, type).

This transfer is based on the fact that the Hitchcock material shows two large highly connate scales on the petal.

Vriesia cylindrica L. B. Smith, sp. nov.

FIGURE 46

A *V. harmsiana* L. B. Smith (cf. sub speciebus peruvianis), cui affinis, spicis brevioribus, ultra bracteas primarias paulo exsertis, infimis exceptis bracteis florigeris haud vel vix carinatis, mox glabris differt.

Epiphytic, stemless, 4–8 dm. high; leaves numerous in a crateriform rosette, 4–6 dm. long, densely and finely appressed-lepidote; sheaths elliptic, 1 dm. long, brown; blades spreading, very narrowly triangular, acuminate, 4 cm. wide at the base; scape short and stout, largely concealed by the leaves; scape-bracts densely imbricate, the lower foliaceous, the upper broadly elliptic with a linear, usually reflexed blade; inflorescence slenderly cylindric, densely bipinnate; lower primary bracts like the upper scape-bracts, the upper merely apiculate, nearly equaling the spikes, obscurely lepidote; spikes strict, elliptic, 6–8 cm. long, 2–3 cm. wide, strongly complanate, dense, 8–12-flowered, bearing a few carinate lepidote sterile bracts at the base; rhachis excavated; floral bracts imbricate, ovate, acute, 24 mm. long, about equaling the sepals, coriaceous, even, all but the

lowest scarcely or not at all carinate and soon glabrous; pedicels 2 mm. long, stout; sepals free, lance-ovate, obtuse or apiculate but the thin margins inrolled and making them appear acuminate, 22 mm. long, coriaceous; petals about 3 cm. long, green with dark purple margins, bearing 2 scales (! Foster); stamens and pistil exerted.



FIGURE 46.—*Vriesia cylindrica*: *a*, Habit, $\times 1/10$; *b*, sepal, $\times 1$.

Type in the U. S. National Herbarium, No. 1985919, collected at Santo Domingo, Province of Esmeraldas, Ecuador, altitude 600 meters, December 8, 1948, by M. B. Foster (No. 2643).

Additional specimens examined:

COLOMBIA:

NARIÑO: In trees, below Altaquer, Río Cuaciquiere, alt. 900 m., Nov. 12, 1946, *M. B. & R. Foster* 2143 (GH). Ricaurte, alt. 1,200 m., Nov. 15, 1946, *M. B. & R. Foster* 2185 (GH).

ECUADOR:

CHIMBORAZO: On tree, Huigra, alt. 1,200 m., July 4–27, 1923, *A. S. Hitchcock* 20739 (US).

Vriesia hitchcockiana (L. B. Smith) L. B. Smith, comb. nov.

Tillandsia hitchcockiana L. B. Smith, *Contr. Gray Herb.* 89: 10, pl. 4, figs. 2–5. 1930.

TYPE LOCALITY: Between El Tambo and La Toma, Province of Loja, Ecuador. Type collected by A. S. Hitchcock (No. 21323).

DISTRIBUTION: Known only from the type.

ECUADOR:

LOJA: On tree, between El Tambo and La Toma, alt. 1,000–2,200 m., Sept. 3, 1923, *Hitchcock* 21323 (GH, type; US).

PERU

Vriesia harmsiana (L. B. Smith) L. B. Smith, comb. nov.

Tillandsia harmsiana L. B. Smith, Contr. Gray Herb. 98: 16, pl. 4, figs. 12-15. 1932.

TYPE LOCALITY: Mito, Province of Huanuco, Peru. Type collected by J. Francis Macbride (No. 3272).

DISTRIBUTION: Known only from the type.

PERU:

HUÁNUCO: Steep rocky shrubby slopes, Mito, alt. ca. 3,000 m., April 8-18, 1923, *Macbride* 3272 (F, type; GH).

NORTHERN SOUTH AMERICA

Vriesia rubra (R. & P.) Beer, Brom. 98. 1857.

Tillandsia rubra R. & P. Fl. Per. 3: 40, pl. 266. 1802.

Vriesia albiflora Ule, Verhandl. Bot. Ver. Brandenburg 48: 141. 1907.

Tillandsia rhododactyla Mez, Repert. Sp. Nov. 16: 76. 1919.

TYPE LOCALITY: Tarma, Department of Junín, Peru. Type collected by Ruiz and Pavon.

DISTRIBUTION: Trinidad, British Guiana, Colombia, western Amazon drainage.

TRINIDAD: Near Tamana, 1868, *Herb. Trin.* 2008 in part (TRIN); Tamana forest, 1915, *Broadway* 7806 (NY, TRIN).

BRITISH GUIANA:

NORTHWEST DISTRICT: Barima River, 1896, *Jenman* 7071 (JENMAN, type collection of *Tillandsia rhododactyla* Mez).

ESSEQUEBO: Epiphyte, Moraballi Creek, Essequibo River, Aug. 20, 1929, *Sandwith* 74 (K); Oct. 22, 1929, *Sandwith* 504 (K).

RUPUNUNI DISTRICT: Upper Rupununi River, near Dadanawa, latitude 2° 45' N., 1922, *Cruz* 1709 (Bailey Hort., F, GH, NY, UC, US).

COLOMBIA:

NORTE DE SANTANDER: Dense jungle, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1694 (GH).

PERU:

HUÁNUCO: Río Huallaga Canyon below Río Santo Domingo, alt. 1,300 m., 1923, *Macbride*, 4265 (F, GH).

JUNÍN: Tropical slopes, Tarma, *Ruiz & Pavon* (F, type collection).

BRAZIL:

ACRE TERRITORY: Epiphytic, by Rio Jurua Miry, June 1901, *Ule* 5615 (Museu Goeldi, Belem, Pará, type collection of *Vriesia albiflora* Ule, photo F).

Type material of *Tillandsia rubra* R. & P. in the herbarium of the Chicago Natural History Museum, as well as a photograph of the type itself in the herbarium at Madrid, show it to be identical with the later *Vriesia albiflora* Ule, and not with *Tillandsia deppeana* Steud., as was formerly supposed.

SYNOPSIS OF THE TRIBE TILLANDSIEAE.³ PART 4

This is the fourth part of a synopsis of the Tillandsieae that distinguishes species without the aid of corolla or stamens. It comprises those species of *Tillandsia* and *Vriesia* with acaulescent habit, narrowly triangular to linear leaf-blades, simple inflorescence, distichous non-secund flowers, and symmetrical sepals. Some species exhibit all of these characters in occasional specimens, but more often lack one or more of them. For instance, several species that normally have leaves distributed along a stem, or have a compound inflorescence, at times produce plants with rosulate leaves or a simple inflorescence. Such species are noted inside parentheses in the present key to indicate that they are logically treated elsewhere, and a footnote is appended whenever they have been treated in a previous part of the synopsis. The criterion of a predominantly simple inflorescence has been strained somewhat in order to include as many as possible of the pseudobulb-bearing species of *Tillandsia* subgenus *Tillandsia* (*Platystachys*).

The pseudobulb species of *Tillandsia* show only slight differences in gross morphology, but very strong contrasts in habitat and range, indicating promising lines of research in ecology and physiology. Their independence from soil removes a complicating factor usually present in such studies, and simplifies deduction of their controls accordingly. Thus, it might be possible to find out why *Tillandsia bulbosa* favors low altitudes while the closely related *T. butzii* grows at 1,200 to 2,300 meters, or why *T. circinnata* is found throughout the Bahamas, while *T. pruinosa* and *T. bulbosa* are not yet recorded there in spite of apparently equal opportunity to make the jump from Cuba.

: KEY TO THE SPECIES

1. Spikes with the flowers distichous or secund or else the inflorescence reduced to a single flower.
 2. Sepals asymmetric, free, oblong or broadest near the apex, not over 10 mm. long.....*Tillandsia* subgenus **Pseudo-Catopsis** ⁴
 2. Sepals symmetric, or if slightly asymmetric, ovate or lanceolate, broadest near the base.
 3. Inflorescence of a single spike or reduced to a single flower, either terminal or pseudoaxillary.
 4. Plant caulescent; leaves distributed along the stem, not rosulate; leaf-blades linear or triangular.....*Tillandsia* in part ⁵
 4. Plant acaulescent, or if the stem is evident then the leaves rosulate at its apex; leaf-blades often ligulate.

³ For the sake of uniformity in this series the tribal designation has been retained, although the group is now generally considered to be a subfamily, the Tillandsioideae.

⁴ Contr. Gray Herb. 89: 15. 1930.

⁵ Proc. Amer. Acad. 70 (Contr. Gray Herb. 106): 156. 1935.

5. Flowers becoming secund at anthesis..... *Vriesia* in part ⁶
5. Flowers not becoming secund at anthesis.
6. Leaf-blades filiform to narrowly triangular, not ligulate.
7. Leaf-sheaths inflated and forming a pseudobulb, their apices closely enfolding the scape or the base of the inflorescence (specimens of *Tillandsia incurva* and *Vriesia chontalensis* sometimes simulate this condition because the rosette is subglobose but the apices of the sheaths are well separated from the scape).
8. Floral bracts shorter than the sepals. 1. *Tillandsia subulifera*
8. Floral bracts equaling or exceeding the sepals.
9. Floral bracts even or nerved only near the margin, glabrous or obscurely lepidote, coriaceous; leaves concolorous or purple-margined, appressed-lepidote.
(*Tillandsia balbisiana*)
9. Floral bracts either strongly nerved or densely lepidote or both together, subcoriaceous to chartaceous.
10. Scape-bracts vaginiform, the upper ones merely apiculate; leaf-blades straight or arched, appressed-lepidote; sepals ecarinate..... 2. *Tillandsia paraënsis*
10. Scape-bracts foliaceous or the scape lacking; leaf-blades usually coiled or contorted.
11. Floral bracts densely cinereous-lepidote with coarse spreading or subspreading scales; scape very short or lacking..... 3. *Tillandsia pruinosa*
11. Floral bracts appressed-lepidote or glabrous; scape generally evident.
12. Leaf-sheaths variegated..... 4. *Tillandsia butzii*
12. Leaf-sheaths green, concolorous or with only a narrow marginal band of red or purple.
13. Leaf-sheaths orbicular, distinct, making a sharp angle with the blades.
14. Scape about as long as the inflorescence; floral bracts 15 mm. long, densely appressed-lepidote.
5. *Tillandsia bulbosa*
14. Scape about twice as long as the inflorescence; floral bracts 10 mm. long, lepidote only along the keel..... (*Tillandsia disticha*)
13. Leaf-sheaths ovate or elliptic, merging into the blades.
15. Floral bracts nearly or quite glabrous.
6. *Tillandsia caput-medusae*
15. Floral bracts densely lepidote.
16. Pseudobulb elongate, one-third to more than one-half the total length of the plant.
7. *Tillandsia circinnata*
16. Pseudobulb relatively much smaller, only 2-5 cm. long..... 8. *Tillandsia baileyi*
7. Leaf-sheaths not forming a pseudobulb, their apices well separated from the scape or the base of the inflorescence.
17. Inflorescence sessile, terminal, 1- (rarely 2-) flowered.
9. *Tillandsia andreana*

⁶ *Lilloa* 6 (Contr. Gray Herb. 137): 388. 1941.

17. Inflorescence scapose, mostly more than 2-flowered.
18. Flowers imbricate at and after anthesis; floral bracts usually imbricate as well.
19. Floral bracts distinctly and consistently shorter than the sepals.
20. Floral bracts densely imbricate and concealing the rhachis; posterior sepals connate for half their length.....10. *Tillandsia exserta*
20. Floral bracts enfolding the barely imbricate flowers, not concealing any part of the rhachis; posterior sepals barely connate.....11. *Tillandsia aurea*
19. Floral bracts equaling or exceeding the sepals.
21. Leaf-blades linear-subulate to filiform.
22. Floral bracts coriaceous or subcoriaceous.
23. Floral bracts glabrous, lustrous.
(*Tillandsia floribunda*)
23. Floral bracts lepidote.
24. Leaf-sheaths 15–20 mm. wide.
(*Tillandsia simulata*)
24. Leaf-sheaths narrower.
(*Tillandsia tenuifolia*)
22. Floral bracts membranaceous.
25. Scales of the leaves linear, spreading; sepals lepidote, 12 mm. long..12. *Tillandsia ignesia*
25. Scales of the leaves orbicular, closely appressed; sepals glabrous, 19–30 mm. long.
26. Floral bracts 25–35 mm. long; sepals to 30 mm. long.....13. *Tillandsia chaetophylla*
26. Floral bracts and sepals not over 20 mm. long.
14. *Tillandsia linearis*
21. Leaf-blades definitely triangular, although often very narrowly so.
27. Floral bracts carinate toward the apex.
28. Leaf-blades with brown cross-bands; inflorescence 3-flowered.....38. *Vriesia jimenezii*
28. Leaf-blades concolorous or longitudinally striped; inflorescence few- to many-flowered.
29. Inflorescence nearly terete; posterior sepals high-connate.
30. Floral bracts sparsely lepidote; posterior sepals completely connate.
15. *Tillandsia rhomboidea*
30. Floral bracts glabrous; posterior sepals only partially connate.....(*Tillandsia acostae*)
29. Inflorescence definitely complanate.
31. Floral bracts coriaceous or subcoriaceous.
32. Inflorescence linear-lanceolate, not more than 12 mm. wide; leaf-sheaths scarcely if at all darker than the blades.
(*Tillandsia polystachia*)
32. Inflorescence lance-elliptic to ovate or oblong, much wider or the leaf-sheaths much darker than the blades.

33. Sepals nearly or quite free.
34. Floral bracts even; inflorescence broad.
35. Inflorescence subax, the floral bracts not concealing the rhachis.
16. *Tillandsia pretiosa*
35. Inflorescence very dense, the rhachis wholly concealed.
36. Leaf-sheaths concolorous; scape elongate; floral bracts lepidote toward the apex.
37. Floral bracts sharply carinate; leaf-sheaths bright purple.
17. *Tillandsia lampropoda*
37. Floral bracts obscurely carinate; leaf-sheaths brown.
39. *Vriesia barclayana*
36. Leaf-sheaths green with longitudinal red stripes; scape very short.
38. Sepals in fruit not more than 4 mm. wide, the posterior ones sharply carinate.
18. *Tillandsia anceps*
38. Sepals in fruit 6 mm. wide, very obtusely carinate if at all.
19. *Tillandsia cyanea*
34. Floral bracts nerved; inflorescence narrow.
39. Scape erect, elongate; flowers usually numerous in each inflorescence, maturing in succession.
20. *Tillandsia lindeni*
39. Scape ascending, short; flowers few in each inflorescence, maturing all together
21. *Tillandsia umbellata*
33. Sepals posteriorly high-connate.
40. Bracts subinvolute beneath the inflorescence; sepals alate; leaf-sheaths deep castaneous.
- (*Tillandsia punctulata*)
40. Bracts not at all involute beneath the inflorescence; sepals scarcely more than carinate.
41. Sides of the inflorescence more or less convex; floral bracts ample.
- (*Tillandsia fasciculata*)
41. Sides of the inflorescence flat; floral bracts 9–18 mm. wide.
- (*Tillandsia tricolor*)

31. Floral bracts thin at least when dry.
42. Floral bracts blackened when dry, probably fleshy when living, uncinatè-incurved.
22. Tillandsia kegeliana
42. Floral bracts not blackened when dry.
43. Leaf-sheaths castaneous; sepals lanceolate, acute... **40. Vriesia chontalensis**
43. Leaf-sheaths green like the blades; sepals oblong, obtuse.
(Tillandsia valenzuelana)
27. Floral bracts ecarinate.
44. Sepals densely and persistently lepidote, at least the posterior ones carinate.
45. Scape two or three times as long as the leaves.
(Tillandsia incarnata)⁷
45. Scape shorter than the leaves.
23. Tillandsia lepidosepala
44. Sepals glabrous or glabrescent or sparsely and obscurely lepidote.
46. Rhachis alate and forming pouches about the bases of the flowers.
47. Leaf-sheaths large, elliptic; inflorescence 30-35 mm. wide.
48. Floral bracts equaling or barely exceeding the sepals, obovate.
39. Vriesia barclayana
48. Floral bracts twice as long as the sepals, broadly elliptic... **24. Tillandsia petraea**
47. Leaf-sheaths small, scarcely distinct from the blades; inflorescence 8 mm. wide.
25. Tillandsia espinosae
46. Rhachis not more than angled.
49. Leaf-sheaths large and conspicuous, often contrasting with the blades.
50. Leaf-blades 4 cm. wide, shorter than the sheaths..... **(Tillandsia walteri)**
50. Leaf-blades much narrower, much longer than the sheaths.
51. Sepals even, 15-20 mm. long; floral bracts not over 35 mm. long.
26. Tillandsia incurva
51. Sepals prominently nerved, to 24 mm. long; floral bracts to 45 mm. long.
27. Tillandsia patula
49. Leaf-sheaths small, narrow and inconspicuous, nearly or quite concolorous with the blades.
52. Leaves strongly pruinose-lepidote, at least on the margins.

⁷ Proc. Amer. Acad. 70 (Contr. Gray Herb. 106): 173. 1935.

53. Floral bracts up to 70 mm. long, glabrous or the lower ones sometimes sparsely lepidote, the margin broad, scarious, nerveless.....(Tillandsia ziphioides)⁸
53. Floral bracts not over 40 mm. long, more or less lepidote.
54. Floral bracts 25–40 mm. long.
55. Sepals free; floral bracts coriaceous.
(Tillandsia boliviensis)
55. Sepals connate posteriorly; floral bracts membranaceous.
28. Tillandsia pueblensis
54. Floral bracts not over 21 mm. long.
56. Floral bracts densely lepidote, not over 11 mm. long.
(Tillandsia didisticha)
56. Floral bracts glabrous or subglabrous, to 21 mm. long.
(Tillandsia lorentziana)
52. Leaves closely appressed-lepidote.
57. Leaf-blades thick and rigid, ridged or keeled.
58. Inflorescence lanceolate or oblanceolate, not over 45 mm. long; leaf-blades abruptly acute; floral bracts and sepals acuminate.
(Tillandsia argentina)⁹
58. Inflorescence linear, elongate; leaf-blades very slenderly acuminate; floral bracts and sepals obtuse.
(Tillandsia vernicosa)
57. Leaf-blades thin, even.
59. Floral bracts elliptic-oblong, obtuse or apiculate, about 2 cm. long; sepals oblong, obtuse.
(Tillandsia valenzuelana)
59. Floral bracts and sepals ovate to lanceolate, acute or acuminate.
60. Sepals up to 26 mm. long, not closely enfolded by the floral bracts.
29. Tillandsia achyrostachys
60. Sepals not over 12 mm. long, closely enfolded by the floral bracts.
30. Tillandsia triglochinoidea
18. Flowers not imbricate at anthesis, either too remote or too spreading.
61. Leaf-blades linear, 1–2 mm. wide; pedicels distinct, 2–5 mm. long..... 31. Tillandsia argentea

⁸ Proc. Amer. Acad. 70 (Contr. Gray Herb. 106): 169. 1935.

⁹ Proc. Amer. Acad. 70 (Contr. Gray Herb. 106): 172. 1935.

61. Leaf-blades narrowly triangular, 5-70 mm. wide at the base.
62. Flowers erect, appressed to the rhachis, remote.
63. Leaves covered with coarse usually spreading scales.
64. Scape and rhachis densely pale-appressed-lepidote, very slender; floral bracts enfolding the flowers, densely lepidote.....11. *Tillandsia aurea*
64. Scape and rhachis glabrous; floral bracts with straight margins or somewhat enfolding the rhachis, glabrous or sparsely lepidote.
32. *Tillandsia karwinakyana*
63. Leaves covered with very fine closely appressed scales.
65. Floral bracts even or but faintly nerved near the margin; rhachis usually geniculate.
(*Tillandsia dasyliriifolia*)
65. Floral bracts prominently nerved throughout; rhachis merely flexuous in most cases.
66. Sepals 14-18 mm. long; rhachis slender.
(*Tillandsia utriculata*)
66. Sepals 25-30 mm. long; rhachis stout.
(*Tillandsia makoyana*)
62. Flowers divergent to spreading and thus failing to be imbricate even when more than twice as long as the internodes.
67. Floral bracts much exceeding the sepals, 45-55 mm. long.
68. Sepals carinate; floral bracts even.
16. *Tillandsia pretiosa*
68. Sepals ecarinate; floral bracts striate.
27. *Tillandsia patula*
67. Floral bracts slightly if at all exceeding the sepals, not much over 20 mm. long at most.
69. Sepals very broadly rounded, subtruncate; rhachis 7 mm. thick.....37. *Vriesia goniorachis*
69. Sepals narrowly rounded to acute; rhachis more slender.
70. Floral bracts exceeding the sepals; flowers only divergent.....30. *Tillandsia triglochinoïdes*
70. Floral bracts equaling or shorter than the sepals; flowers mostly spreading.
71. Floral bracts about equaling the internodes; flowers spreading; pedicels to 7 mm. long.
(*Tillandsia flexuosa*)
71. Floral bracts longer than the internodes; pedicels short.
72. Flowers spreading at anthesis.
73. Rhachis excavated.
33. *Tillandsia monadelphæ*

73. Rhachis merely angled.

74. Floral bracts only about twice as long as the slender internodes, barely carinate.

34. *Tillandsia narthecioides*

74. Floral bracts about four times as long as the stout internodes, sharply carinate....35. *Tillandsia scaligera*

72. Flowers divergent at anthesis; floral bracts ecarinate.....36. *Tillandsia cornuta*

6. Leaf-blades ligulate, rounded and apiculate to broadly acute, or if acuminate then only for the apical part.

(To be continued.)

1. *Tillandsia* (*Tillandsia*) *subulifera* Mez, Repert. Sp. Nov. Fedde 16: 74. 1919.

FIGURE 47

Stemless, 15–19 cm. high; leaves few in a distinct but slenderly cylindric pseudobulb, erect, the inner ones up to 18 cm. long, the

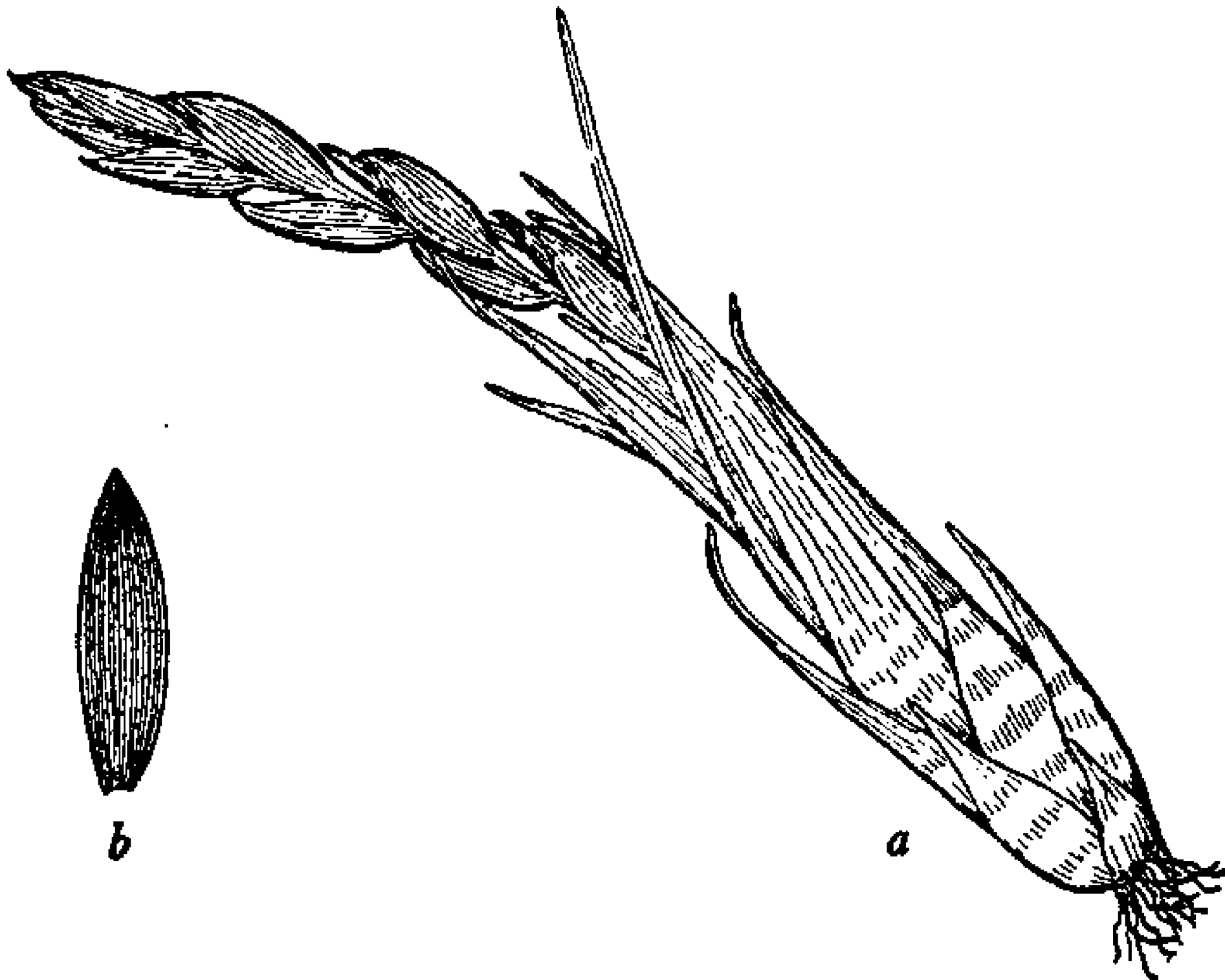


FIGURE 47.—*Tillandsia subulifera*: *a*, Habit, $\times 1/2$; *b*, sepal, $\times 1$.

outer greatly reduced, appressed-canescens-lepidote, concolorous or with faint white cross-bands; sheaths about half as long as the blades, ample; blades linear, abruptly acute or obtuse, 5 mm. wide at the base, complicate, strongly angled; scape erect, slender, exceeded and largely concealed by the leaves; scape-bracts subfoliaceous, erect, imbricate, many-nerved, densely lepidote; inflorescence erect, simple, oblong or linear, 5–7 cm. long, 4–6-flowered; axis slender, geniculate, mostly not covered by the floral bracts, appressed-lepidote; floral

bracts erect, elliptic, broadly acute, 2 cm. long, shorter than the sepals, incurved and more or less carinate toward the apex, prominently nerved, appressed-lepidote; flowers erect, short-pedicellate; sepals elliptic, narrowly obtuse, 22 mm. long, prominently nerved, appressed-lepidote, free; petals erect, 32 mm. long, yellow or white when dry; stamens exerted; capsule slenderly cylindric, acuminate, 6 cm. long.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. 31: fig. 119.

TYPE LOCALITY: By Longdenville, Trinidad, British West Indies. Type collected by Broadway (No. 4200).

DISTRIBUTION: Panama, Trinidad.

PANAMA:

CANAL ZONE: Las Cascadas Plantation, near Summit, Jan. 4, 1924, *Standley* 29664 (US). Barro Colorado Island, Aug. 1928, *Chickering* 62 (MICH); Aug. 26, 1934, *Shattuck* 1166 (F).

TRINIDAD: By Longdenville, *Broadway* 4200 (Berlin, type). On *Theobroma*, Tabaquite, Oct. 14, 1918, *Broadway* (US).

2. *Tillandsia* (*Tillandsia*) *paraënsis* Mez in Mart. Fl. Bras. 3, pt. 3: 586, pl. 109. 1894. FIGURE 48

Tillandsia boliviensis Baker, Mem. Torrey Club 4: 267. 1895, in part but not as to type.

Vriesia sanctae-crucis S. Moore, Trans. Linn. Soc. Bot. II. 4: 491. 1895.

Tillandsia sanctae-crucis S. Moore ex Mez in DC. Monogr. Phan. 9: 710. 1896.

Tillandsia juruana Ule, Verh. Bot. Ver. Brand. 48: 143. 1907.



FIGURE 48.—*Tillandsia paraënsis*: a, Habit, $\times 1/4$; b, sepal, $\times 1$.

Plant stemless, 15–46 cm. high; leaves rosulate, to 35 cm. long, minutely pale-appressed-lepidote throughout, the outer ones reduced to small acute sheaths, the inner sheaths large, ovate, convex and forming an ovoid pseudobulb, blades very narrowly triangular, abruptly acute, pungent, straight or curved, involute; scape curved, suberect, 3 mm. in diameter, sparsely lepidote; scape-bracts elliptic,

equaling or slightly exceeding the internodes, densely lepidote, the lower long-laminate, the upper apiculate; inflorescence simple or of two spikes; primary bract like the upper scape-bracts, much shorter than the axillary spike; spikes linear, complanate, 6–17-flowered, up to 25 cm. long; floral bracts erect and imbricate but later convolute about the flowers and exposing the rhachis, broadly elliptic or sub-orbicular, obtuse or minutely apiculate, 25–32 mm. long, much exceeding the sepals, convex, ecarinate, nerved, subchartaceous, greenish, yellowish, or purplish, densely lepidote; pedicels very short; sepals free, elliptic, acute, 24 mm. long, ecarinate, lepidote; petals 33–70 mm. long, erect, red, shorter than the stamens; capsule cylindrical, acute, 3–7 cm. long.

TYPE LOCALITY: Probably in the vicinity of Belém, which is also known as Pará, state of Pará, Brazil. Type collected by Siber (No. 68).

DISTRIBUTION: Colombia, Peru, Bolivia, western Brazil.

COLOMBIA:

VAUPÉS: Epiphytic, banks of the Río Cuduyarí, tributary of the Río Vaupés, alt. 200 m., Sept. 15, 1939, *Cuatrecasas* 6835 (Hb. Nac. Colomb.). Epiphytic, Bacuraba Cachoeira, the first major cataract on the Vaupés east of Mitu, alt. ca. 200 m., Nov. 4, 1944, *Allen* 3319 (US).

PERU:

LORETO: Caballo-Cocha on the Amazon River, Aug. 1929, *L. Williams* 2251 (F, GH). Epiphyte, dense forest, Mishuyacu, near Iquitos, alt. ca. 100 m., Sept. 24–28, 1929, *Killip & Smith* 29914 (US); Feb.–Mar. 1930, *Klug* 1020, 1059 (US); April 1930, *Klug* 1197 (F, NY, US).

BOLIVIA: *Bang* 159a in part (K, NY).

LA PAZ: Sur Yungas: Santa Ana, Bopi River, alt. ca. 400 m., Sept. 27, 1921, *O. E. White* 1087 (MICH, NY). Basin of Río Bopi, San Bartolome (near Calisaya), alt. 750–900 m., July 1–22, 1939, *Krukoff* 10045, 10229 (NY). Prov. Larecaja: Tuirí, near Mapiri on left bank of Río Mapiri, alt. 490–750 m., Sept. 12–30, 1939, *Krukoff* 10908 (F, GH, MO, NY).

SANTA CRUZ: Ichilo: On trees, Río Yapacani, alt. 350 m., Oct. 7, 1926, *Steinbach* 7596 bis (GH, NY).

BRAZIL:

AMAZONAS: Epiphyte, Juruá Miry, July 1901, *Ule* 5734 (Berlin, type of *Tillandsia juruana* Ule, Macbride photo No. 11508). Humayta, near Livramento, Oct.–Nov. 1934, *Krukoff* 6774 (NY).

ACRE TERRITORY: Near the mouth of the Rio Macauhan, a tributary of the Rio Yaco, latitude 9° 20' S., longitude 69° W., Aug. 14, 1933, *Krukoff* 5499 (F, GH, MICH, MO, NY).

PARÁ: 1826, *Siber* 68 (BR, type).

MATO GROSSO: Epiphytic, near Santa Cruz, Sept. 1891, *S. Moore* 361 (BM, type of *Vriesia sanctae-crucis* S. Moore). Utiarity, July 1909, *Hoehne* 2032 (Mus. Nac. Rio). Rio Juruena, Jan. 1911, *Hoehne* 5162, 5163 (Mus. Nac. Rio). Buritizinho, below Mount Itapirapuan, April 17, 1894, *Lindman* A3379 (S).

Offhand, *Tillandsia juruana* would appear to differ from *T. parensis* in having imbricate floral bracts, but this is simply a difference

in age, the floral bracts becoming convolute about the flowers, and the two stages sometimes appearing on a single inflorescence.

3. *Tillandsia* (*Tillandsia*) *pruinosa* Swartz, Fl. Ind. Occ. 1: 594. 1797.

FIGURE 49

Tillandsia breviscapa A. Rich. in Sagra, Hist. Cuba 11: 265. 1850.

Platystachys pruinosa Beer, Bromel. 265, 1857.

Platystachys tortilis Beer, Bromel. 266. 1857.

Stemless, 8–20 cm. high; leaves in an elongate pseudobulb, up to 2 dm. long, densely cinereous- or ferruginous-lepidote with coarse

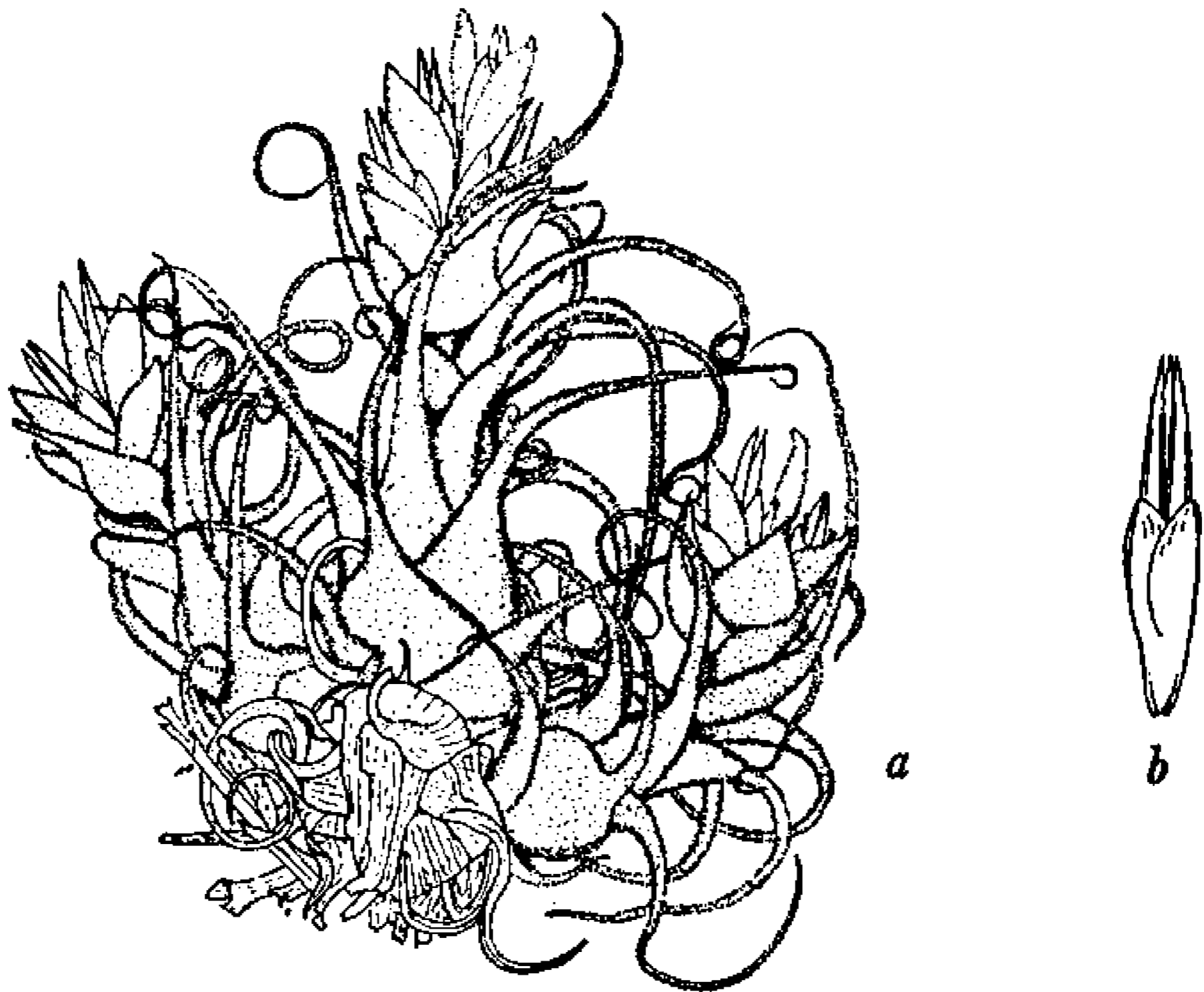


FIGURE 49.—*Tillandsia pruinosa*: a, Habit, $\times 1/2$; b, posterior sepals and capsule, $\times 1$.

spreading scales; sheaths elliptic to suborbicular, 2–4 cm. long, strongly inflated, abruptly contracted into the blade at the apex and the inner ones closely enfolding the base of the inflorescence, castaneous; blades usually exceeding the inflorescence, linear, involute-subulate, filiform-acuminate, recurved or contorted, 2–4 mm. in diameter; scape very short to none; inflorescence simple or rarely digitately compound from 2 or 3 spikes; spikes densely 5–15-flowered, up to 7 cm. long and 4 cm. wide but usually much smaller, acute, complanate; rhachis straight, angled, densely lepidote; floral bracts erect, four or five times as long as the internodes, ovate, acute, 20–26 mm. long, much exceeding the sepals, carinate toward the apex, subcoriaceous, pink at anthesis, densely lepidote with coarse spreading scales; flowers sessile; sepals broadly elliptic, obtuse, 13–19 mm. long, sparsely lepidote or glabrous, coriaceous, the posterior ones connate up to 6 mm.; petals linear, obtuse or acute, 3 cm. long, violet; stamens exerted; capsule cylindric, acute, up to 55 mm. long.

ILLUSTRATIONS: Belg. Hort. 26: pl. 16, 17.

TYPE LOCALITY: Jamaica. Type collected by Swartz.

DISTRIBUTION: Florida, southern Mexico and Cuba to Ecuador and Brazil.

UNITED STATES:

FLORIDA: Collier County: Big Cypress, about 75–80 miles west of Miami, just north of the town of Everglades, Feb. 7, 1948, *R. Woodbury* (US).

MEXICO:

VERA CRUZ: Zacuapan, May 1919, *Purpus* 8229 (GH, MO, NY, US); 1929, *Skwarra* (GH). Mirador, May 24, 1929, *Skwarra* 18 (GH).

GUATEMALA:

PETÉN: Chicbul, La Libertad, April 8, 1933, *Lundell* 2626 (MICH). Monte Santa Teresa, April 14, 1933, *Lundell* 2900 (GH). Occupied clearing, La Libertad, April 20, 1933, *Lundell* 2911 (MICH).

BRITISH HONDURAS:

EL CAYO DISTRICT: Epiphyte in advanced forest, limestone valley, Valentin, June–July, 1936, *Lundell* 6272 (MICH).

HONDURAS:

CORTES: On tree, near shore of Lake Yojoa, alt. 630 m., July 29, 1934, *Yuncker* 4839 (F, MICH, MO).

COMAYAGUA: Vicinity of Siguatepeque, alt. 1,080–1,400 m., Feb. 14–27, 1928, *Standley* 56374 (F).

ATLÁNTIDA: On tree, Lancetilla Valley near Tela, alt. 20–600 m., Dec. 1927–Mar. 1928, *Standley* 54619, 56584 (F). Epiphyte, Lancetilla, Lancetilla Valley, June–July, 1929, *Chickering* 123a (MICH).

NICARAGUA:

JINOTEGA: In region of pine forest, southwest of Jinotega, along road to La Cantera and Los Pinos, alt. 1,050–1,350 m., June 25, 1947, *Standley* 10138 (F).

COSTA RICA:

GUANACASTE: On tree, El Arenal, alt. 485–600 m., Jan. 18, 19, 1926, *Standley & Valerio* 45325 (US).

LIMÓN: On tree in wet forest, Finca Montecristo on the Río Reventazón below Cairo, alt. ca. 25 m., Feb. 18, 19, 1926, *Standley & Valerio* 48998 (US).

CARTAGO: On tree, vicinity of Finca Las Cóncavas, alt. 1,200–1,300 m., Dec. 7, 8, 1925, *Standley* 41425 (US). On tree, vicinity of Pejivalle, alt. ca. 900 m., Feb. 7, 8, 1926, *Standley & Valerio* 47294 (US).

CUBA: Ex hb. Shuttleworth, 1849, *Rugel* with No. 246 (BM). *Sagra* (P, type of *Tillandsia breviscapa* A. Rich.).

ISLE OF PINES: On trees, coastal plain, San Juan, March 15, 17, 1916, *N. L. & E. G. Britton & Wilson* 15479 (F, NY).

PINAR DEL RÍO: On tree, hillside, trail from Buenaventura to San Juan de Guacamalla, Dec. 16, 1910, *Wilson* 9341 (NY). On tree, Sierra de Anafe, Dec. 18, 1911, *Wilson* 11403 (NY). On tree, Sierra de Cabra, Mar. 6, 1911, *N. L. & E. G. Britton & Cowell* 9820 (NY). On trees in savanna, San Gabriel to Santa Monica, Jan. 19, 1912, *Shafer* 11886 (NY). On live oak, Los Palacios to San Pablo de las Yeguas, Jan. 26, 1912, *Shafer* 11914 (NY). On bushes, Sierra Caliente, south of Sumidero, Aug. 15, 18, 1912, *Shafer* 13776 (NY).

LAS VILLAS (SANTA CLARA): On branches of trees in savannas, Cieneguita S., Dec. 7, 1895, *Combs* 671 (GH, MO). On trees, near Guanábana, Trinidad Mountains, alt. 260 m., Feb.–Mar., 1910, *N. L. Britton, Earle, & Wilson* 4768 (F, NY). On tree, Guajimica, Mar. 23, 1910, *N. L.*

Britton, Earle, & Wilson 5831 (NY). On shrub, palm barren, city of Santa Clara, Mar. 29–31, 1910, *N. L. & E. G. Britton, & Wilson* 6146 (NY). Banks of Yayabo River, near Pico Tuerto, Dec. 1911, *Clement* 2882 (NY). On tree trunks, Rincón to Banao, Mar. 3, 1912, *Shafer* 12322 (NY). Banao Mountains, Aug. 2, 1918, *León & Roca* 8077 (NY). On guazuma tree, San Blas, La Sierra, alt. 180–240 m., Mar. 1, 1928, *Jack* 6462 (GH); same, El Purial, Mar. 14, 1932, *Jack* 8561 (GH, NY). High on royal palm, Mina Carlota, southeast of Cumanayagua, Sierra de San Juan, alt. 300–400 m., Mar. 21–23, 1938, *Senn* 269 (US). Epiphytic along trail, 5 km. north of San Blas, June 1941, *Howard* 5369 (GH).

ORIENTE: On trees, "in Cuba Orientali," 1856–7, *Wright* 686 (BM, GH, MO, NY, US). Near river on tree, Holguin to Myabe, April 16, 1909, *Shafer* 1416 (NY). On trees, scarce, forest about Paso Estancia, April 27, 1909, *Shafer* 1593 (NY). On tree trunk by streamlet, the Pinales, southeast of Paso Estancia, May 1, 2, 1909, *Shafer* 1821 (NY). On tree overhanging big falls, Arroyo del Medio, Jan. 1910, *Shafer* 3328 (NY). On logwood tree, Monte Verde, alt. 660 m., Feb. 13, 1911, *Shafer* 8699 (NY). Near Santiago, May 1937, *Foster* III (GH).

SAN DOMINGO:

SANTIAGO: District of San José de las Matas: On trees, Jicomé, alt. 700 m., Dec. 18, 1929, *Valeur* 294 (F, MO, US); May 12, 1933, *Valeur* 991 (US). Abundant on trees, woods of *Pinus occidentalis*, vicinity of Rubio, alt. 560 m., April 17, 1946, *Jimenez* 1092 (US).

SAN JUAN: On lower surfaces of branches, hillslopes, vicinity of Río Arriba del Norte, north of San Juan, Sept. 9–14, 1946, *Howard* 8832 (GH).

MONTE CRISTI: Monción, alt. 550 m., Jan. 16, 1950, *Mera in hb. Jimenez* 1894 (US).

JAMAICA: *Swartz* (S, type).

SURREY: Near Gordon Town, alt. 255 m., Feb. 15, 1895, *Harris* 5527 (NY).

MIDDLESEX: On trees, Chapelton to Bull Head, Sept. 18, 1906, *Underwood* 3421 (NY).

CORNWALL: On trees, Troy, Cockpit Country, Sept. 13–18, 1906, *Britton* 506 (NY). Giddy Hall, St. Elizabeth, Feb. 16, 1926, *Maxwell* (BM).

VENEZUELA: *Fendler* 2448 (! Mez).

COLOMBIA:

NORTE DE SANTANDER: Epiphytic, Río Catumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1657 (GH).

ANTIOQUIA: Bello, Aug. 1944, *Emmanuel & Daniel* 3313 (GH, MO).

ECUADOR:

EL ORO: On tree, dry hill, Portovelo (gold mine near Zaruma), alt. 600–1,000 m., Aug.–Sept. 1923, *Hitchcock* 21259 (GH, NY, US).

BRAZIL; *Glaziou* 15462 (P).

ESPÍRITO SANTO: Jacu River, Victoria, alt. ca. 80 m., July 14, 1939, *Foster* 205 (GH).

RIO DE JANEIRO: Cantagallo, Aug. 24, 1884, *Glaziou* 16461 (P).

DISTRITO FEDERAL: Epiphyte, Restinga de Mauá, Rio de Janeiro, July 20, 1895, *Ule* 4052 (Mus. Nac. Rio).

4. *Tillandsia* (*Tillandsia*) *butzii* Mez in Engl. Pflanzenreich IV. 32: 636. 1935. FIGURE 50

Tillandsia variegata Schlecht, *Linnaea* 18: 429. 1844, not Vell. 1825.

Plant stemless, 2–3 dm. high; leaves few in a bulbous rosette, up to 5 dm. long, densely and finely pale-appressed-lepidote throughout,

the margins at first ciliate with coarse scales; sheaths suborbicular, inflated, forming a pseudobulb 25–45 mm. in diameter, dark brown or purple with numerous large pale green often confluent spots;

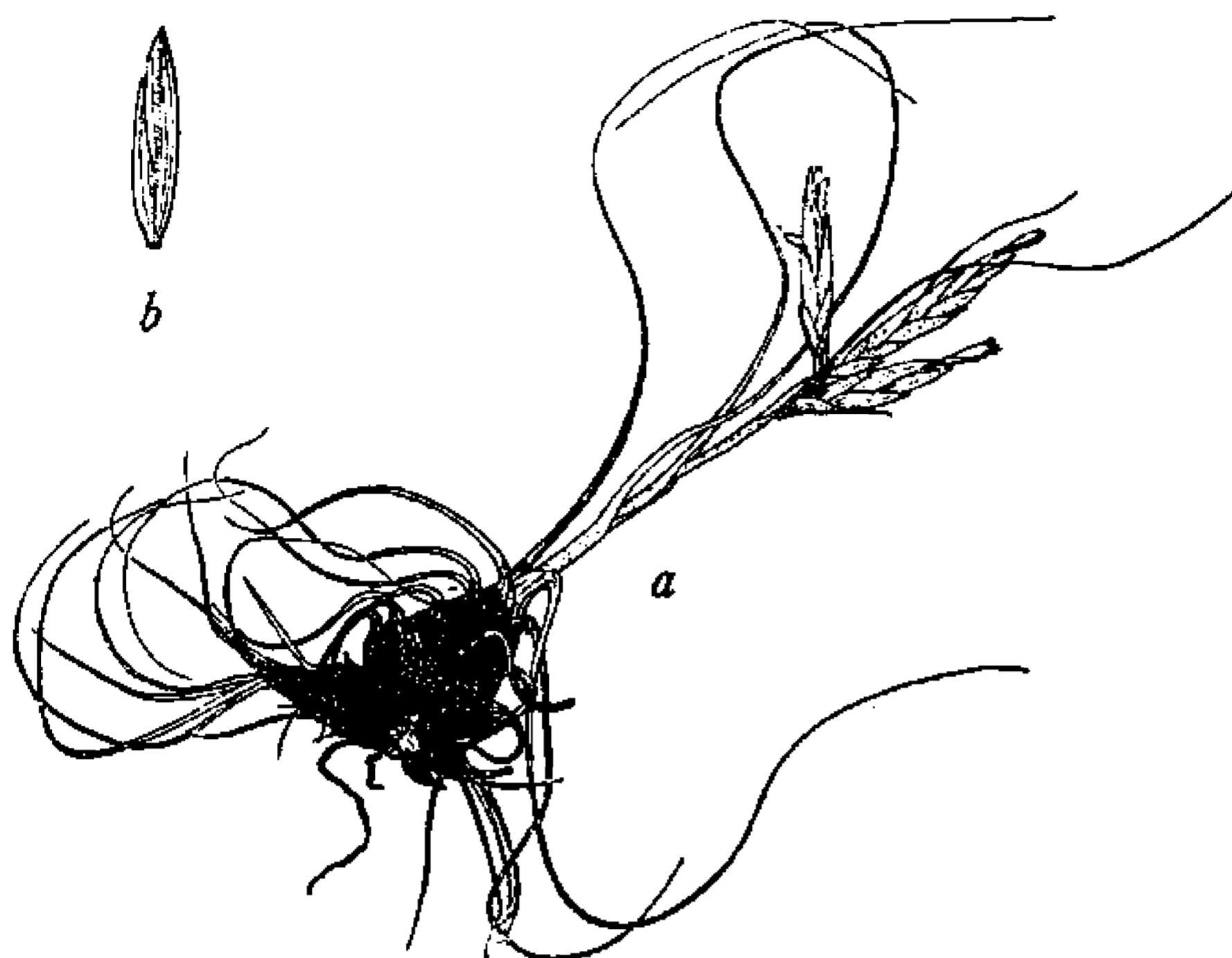


FIGURE 50.—*Tillandsia butzii*: *a*, Habit, $\times 1/4$; *b*, posterior sepals, $\times 1$.

blades involute-subulate, filiform-acuminate, 3 mm. in diameter, contorted; scape erect, slender; scape-bracts foliaceous, imbricate; inflorescence digitate from a few subequal spikes or rarely simple; primary bracts subfoliaceous, concolorous, the broadly ovate sheath much shorter than the axillary spike, the linear blade often much exceeding it; spikes erect to spreading, linear, acute, strongly complanate, 6–8 cm. long, about 1 cm. wide at anthesis, 5–8-flowered with 1 or 2 sterile bracts at the base; floral bracts erect, imbricate, ovate, acute, 20–28 mm. long, 10 mm. wide, much exceeding the sepals, three to four times as long as the internodes, subcoriaceous, densely pale-appressed-lepidote, prominently nerved and sometimes incurved or slightly carinate toward the apex; flowers subsessile; sepals narrowly elliptic, narrowly obtuse, 12–15 mm. long, coriaceous, glabrous, posteriorly connate for 4 mm.; petals erect, 30–35 mm. long, violet; stamens and pistil exserted; capsule slenderly cylindrical, acute, short-beaked, 3 cm. long.

ILLUSTRATIONS: *Garten-Zeit.* Berlin 4: *pl.* 44.

TYPE LOCALITY: Jalapa, Mexico. Type collected by Schiede.

DISTRIBUTION: Southern Mexico to Panama.

MEXICO: *Nuttall* (BM). Aug. 1853, *F. Müller* (NY). April 1931, *Purpus* 15765 (MICH).

VERA CRUZ: Orizaba, (ca. 1864), *Botteri* 1001 (GH). Valley of Córdoba, Mar. 17, (ca. 1865–6), *Bourgeau* 2192 (P). Jalapa, *Schiede* (Berlin, type); Aug. 1866, *Hahn* (P); Oct. 1888, *Com. Geogr. Explor. Rep. Mex.* (F, GH). On trees near Jalapa, alt. ca. 1,200 m., Mar.–May, 1899, *Pringle* 8189

- (BM, F, GH, MO, NY, US). On trees, Zacuapan, Mar. 1913, *Purpus* 6343 (BM, F, GH, MO, NY, US). Mirador, May 10, 1929, *Skwarra* (GH). Near Banderilla, 1938, *Foster* II (GH).
- MÉXICO: Valley of México, June 30, 1901, *Rose & Hay* 205 (US).
- OAXACA: Cerro Gavilán, Cuyamecalco, District of Cuicatlán, alt. 1,800 m., April 17, 1919, *Conzatti & Gómez* 3491 (US). Epiphyte, near Ayutla, alt. ca. 1,650 m., Mar. 15, 1939, *Bevan* 399 (GH).
- CHIAPAS: Canjob, Mar. 27, 1904, *Goldman* 801 (US). Mount Pasitar, Dec. 1936, *Matuda* 358 (MICH, MO, US). Mount Ovando, Feb. 1939, *Matuda* 2657 (NY).

GUATEMALA:

- QUICHÉ: On tree between Quiché and San Pedro Jocopilas, alt. 1,800-2,100 m., Jan. 12, 1939, *Standley* 62463 (F).
- HUEHUETENANGO: On tree, common, mountains northwest of Malacatancito, alt. 1,800-2,400 m., Jan. 14, 1939, *Standley* 62638 (F). On oak tree, along Aguacatán road east of Huehuetenango at Km. 13-14, alt. ca. 1,950 m., Jan. 2, 1941, *Standley* 82028 (F, GH).
- ALTA VERAPAZ: Cobán, alt., 1,350 m., Mar. 1908, *Tuerckheim* II 2187 (US). On pine tree, Cobán, alt. 1,200 m., Sept. 1, 1920, *Johnson* 721 (US). On tree, wet forest near Tactic, above bridge across Río Frío, alt. ca. 1,400-1,500 m., Mar. 30, 1941, *Standley* 90467 (F, GH). On tree near Tactic, alt. ca. 1,500 m., April 10, 1941, *Standley* 92020 (F). On mossy hummock, large swamp east of Tactic, alt. ca. 1,450 m., April 14, 1941, *Standley* 92367 (F).
- BAJA VERAPAZ: Santa Rosa, alt. ca. 1,500 m., April 1887, *Tuerckheim in J. D. Smith* 1172 (GH, US). On tree in forests of pine and oak, dry rocky hills north of Santa Rosa, Mar. 30, 1939, *Standley* 69752 (F). On tree in pine-oak forest, rocky hills near Santa Rosa, alt. ca. 1,500 m., April 4, 1941, *Standley* 91261 (F).
- SAN MARCOS: Upper pine slopes bordering Río Malacate, barrancos 6 miles south and west of town of Tajumulco, northwest slopes of Volcán Tajumulco, alt. 2,300-2,800 m., Feb. 26, 1940, *Steyermark* 36686 (F).
- QUEZALTENANGO: Epiphyte in cafetal, lower south slopes of Volcán Santa María, between Santa María de Jesús and Calahuaché, along great barranco between Finca Pirineos and San Juan Patzulín, alt. 1,300-1,500 m., Jan. 6, 1940, *Steyermark* 33669 (F). Epiphyte, Volcán Santa María, between Santa María de Jesús, Los Mojadas and summit of volcano, alt. 1,500-3,000 m., Jan. 12, 1940, *Steyermark* 33937 (F).
- EL PROGRESO: Near Schwendener Finca above Morazán, alt. 1,290 m., Feb. 26, 1945, *Sharp* 45271 (U. Tenn.).
- ZACAPA: Along Rillito del Volcán de Monos, Volcán de Monos, alt. 1,150-2,100 m., Jan. 10, 1942, *Steyermark* 42366 (F, GH).
- CHIQUIMULA: Epiphyte, Cerro Tixixi, 3-5 miles north of Jocotán, alt. 500-1,500 m., Nov. 10, 1939, *Steyermark* 31654 (F).
- JALAPA: On tree in barranco on south slopes 3/4 way up, Volcán Jumay, north of Jalapa, alt. 1,300-2,200 m., Dec. 1, 1939, *Steyermark* 32443 (F, GH).
- SUCHITEPÉQUEZ: Volcán Santa Clara, between Finca El Naranjo and upper slopes, alt. 1,250-2,650 m., May 23, 1942, *Steyermark* 46614 (F, GH).
- SANTA ROSA: Zamorora, alt. ca. 1,650 m., April 1893, *Heyde & Lux in J. D. Smith* 4628 (GH, US).

HONDURAS:

COMAYAGUA: Epiphyte, in ravine near El Achote, above the plains of Siguatepeque, alt. 1,350 m., July 19, 1936, *Yuncker, Dawson, & Youse* 5981 (GH, MO).

MORAZÁN: Uyuca, alt. 1,238 m., Aug. 1943, *Rodriguez* 590 (F). Slopes of Valle Encantado, Mount Uyuca, alt. 1,500 m., Dec. 8, 1946, *Williams & Molina* 11183 (GH). On tree, lower slopes of Cerro de Uyuca, alt. 1,530–1,600 m., Feb. 22, 1947, *Standley & Molina* 4340 (F).

EL PARAISO: Güinope, alt. 1,430 m., Dec. 1943, *Rodriguez* 1850 (F).

EL SALVADOR:

SAN VICENTE: On tree, Volcán de San Vicente, alt. 1,200–1,500 m., Mar. 7–8, 1922, *Standley* 21546 (GH, US).

COSTA RICA:

ALAJUELA: Canton Alfaro Ruiz, Zarcero, high limb of forest tree, alt. 1,700 m., Jan. 26, 1939, *A. Smith* NY-1563 (GH). Tapesco road to La Peña, region of Zarcero, *A. Smith* P-211 (F).

CARTAGO: Cartago, alt. ca. 1,250 m., Jan. 1887, *Cooper in J. D. Smith* 5955 (GH, US); April 1894, *J. D. Smith* 4965 (GH, US). Slopes of Irazu above San Rafael de Cartago, alt. 1,500 m., Dec. 1894, *H. Pittier* 9104 (US). Forests between Trejos and Las Vueltas, Tucurrique, alt. 900–1,000 m., April 1899, *Tonduz* 13061 (US). Vicinity of Cartago, alt. 1,500 m., April 19, 1906, *Maxon* 61 (US); alt. 1,425 m., Feb. 1924, *Standley* 33329 (US). Aguacaliente, Feb. 10, 1922, *Greenman* 5553 (GH, MO). Dulce Nombre, alt. ca. 1,400 m., Feb. 27, 1924, *Standley* 35796 (US). La Estrella, Mar. 26, 27, 1924, *Standley* 39502 (US). On tree, along Río Reventado, north of Cartago, alt. 1,460–1,650 m., Feb. 26, 1926, *Standley & Valerio* 49508, 49515 (US). On trees of potrero 1 mile east of Cartago, alt. ca. 1,400 m., Feb. 19, 1928, *Stork* 1008 (F, MICH). Between Santiago and Picacho Mondongo Jan. 23, 1933, *Brenes* 16975 (F). San Isidro, Cartago, alt. 1,400 m., Feb. 11, 1938, *Valerio* 1723 (F). Crown of tree, lower slope of Cerro de Carpintera, Aug. 22, 1940, *Chrysler* 5533 (F).

PANAMA:

CHIRIQUÍ: Pastures around El Boquete, alt. 1,000–1,300 m., Mar. 1911, *H. Pittier* 3011 (GH, US). Epiphytic on oak, trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, alt. 1,500–2,000 m., Jan. 16, 1939, *Allen* 1592 (MO).

The finely variegated bulbous leaf-sheaths of *Tillandsia butzii* are unique, making it one of the few species that can be identified positively from sterile material.

5. *Tillandsia* (*Tillandsia*) *bulbosa* Hook. Exot. Fl. 3: pl. 173. 1826. FIGURE 51
Tillandsia bulbosa β . *brasiliensis* Schult. in Roem & Schult. Syst. Veg. 7:
1212. 1830.

Tillandsia bulbosa var. *picta* Hook. Bot. Mag. Curtis 73: pl. 4288. 1847.

Pourretia hanisiana Morr. ex Morr. Ann. Gand. 3: 255. 1847, in synonymy.

Tillandsia inanis Lindl. & Paxt. Fl. Gard. 1: 159. 1850.

Tillandsia erythraea Lindl. & Paxt. Fl. Gard. 1: 160. 1850.

Tillandsia pumila Lindl. & Paxt. Fl. Gard. 1: 160. 1850.

Platystachys inanis Beer, Bromel. 82. 1857.

Platystachys bulbosa Beer, Bromel. 83. 1857.

Platystachys erythraea Beer, Bromel. 83. 1857.



FIGURE 51.—*Tillandsia bulbosa*: a, Habit, $\times 1/3$, after Hooker, Exot. Fl. *Tillandsia caput-medusae*: b, Habit, $\times 1/3$; c, upper scape and compound inflorescence, $\times 1/3$.

Plants stemless, usually densely aggregated, 7–32 cm. high; leaves 8–15, often exceeding the inflorescence, covered with fine closely appressed cinereous scales; sheaths orbicular, abruptly contracted into the blades, greatly inflated, 2–5 cm. long, forming a dense ovoid pseudobulb, green or greenish white, often with a narrow red or purple marginal band; blades involute-subulate, acuminate, contorted, spreading and at least the outer ones making a sharp angle with the apex of the sheath, up to 3 dm. long, 2–7 mm. in diameter; scape erect; scape-bracts foliaceous in form with elongate blades exceeding the inflorescence, the upper ones often red; inflorescence simple or subdigitate from a few spikes, red or green; primary bracts ovate, acute, much shorter than the axillary spikes but their foliaceous blades sometimes exceeding them; spikes spreading, lanceolate, acute, complanate, 2–6 cm. long, 2–8-flowered; rhachis slender, lepidote; floral bracts erect, imbricate, ovate, acute, 15 mm. long, exceeding the sepals, two to three times as long as the internodes, subchartaceous, densely and finely appressed-lepidote, carinate; flowers sessile; sepals oblong, apiculate, 13 mm. long, glabrous, more or less connate posteriorly; petals linear, acute, 3–4 cm. long, blue or violet; stamens and pistil exserted; capsule cylindrical, up to 4 cm. long.

ILLUSTRATIONS: Ann. Gand 3: pl. 142; Fl. Serres 3: pl. 221; Bot. Mitteil. Trop. 2: pl. 4; Bull. Sci. France & Belg. 47: pl. 7.

TYPE LOCALITY: Trinidad. Type collected by the Baron de Schack, but evidently not preserved as a herbarium specimen.

DISTRIBUTION: Southern Mexico and the West Indies to Colombia and eastern Brazil.

MEXICO:

TABASCO: Epiphytic, Reforma, Balancán, May 1939, *Matuda* 3180 (F, GH).

CAMPECHE: On *Haematoyxylum campechianum*, abundant in the southern part of the state, 1934, *Flores* 3 (F).

QUINTANA ROO: Lake Chichancanab, April 1917, *Gaumer* 23722 (F).

GUATEMALA:

PETÉN: Naranjo, Tikal District, alt. 100–500 m., Mar. 19, 1922, *Cook & Martin* 54 (US). La Libertad, April 1933, *Lundell* 2628 (MICH); 2932 (GH).

ALTA VERAPAZ: 1½–2 miles south of Cubilgüitz, alt. 300–350 m., Mar. 1, 1942, *Steyermark* 44434 (F). Vicinity of Laguna Sapalá (Chajvonuch), 1 mile southwest of Sibicté, alt. 280 m., Mar. 11, 1942, *Steyermark* 44935 (F). Epiphyte on lower half of slopes, Cerro Chinajá, between Finca Yalpemech and Chinajá, above source of Río San Diego, alt. 150–700 m., April 1–2, 1942, *Steyermark* 45584 (F).

IZABAL: Puerto Barrios, *Deam* 40 (MO). Jocoló, alt. 30 m., Jan. 1921, *Johnson* 1087, 1089, 1091, 1181 (US). On pine tree, vicinity of Quiriguá, alt. 75–225 m., May 15–31, 1922, *Standley* 24229 (GH, MO, NY, US). On tree near Entre Ríos, alt. ca. 18 m., April 30, 1939, *Standley* 72788 (F). Epiphyte, dry pine-clad slopes, between Milla 49.5 and ridge 6 miles from Izabal, Montaña del Mico, alt. 65–600 m., April 1, 1940, *Steyermark* 38543 (F). Common epiphyte on limbs of trees all along coast, Bay of Santo Tomás, between Escobas and Santo Tomás, alt. 0–2 m., April 13, 1940, *Steyermark* 39253 (F, GH). Epiphyte, upper slopes, along Río Frío and tributaries, alt. 75–150 m., Dec. 18, 1941, *Steyermark* 41535 (F). Common along Río Dulce below junction with Río Tameja, Dec. 28, 1941, *Steyermark* 42016 (F, GH).

BRITISH HONDURAS:

BELIZE DISTRICT: Pine ridge near Manatee Lagoon, Nov. 23, 1905, *Peck* 965 (GH). Epiphyte, pine ridge north of aviation field, Belize, Jan. 28, 1931, *Bartlett* 11202 (MICH). Big Fall, Belize River, Mar. 21, 1933, *Lundell* 3957 (GH). Maskall, April 9, 10, 1934, *Gentle* 1236 (GH, NY); 1314 (GH). One mile west of Maskall, New River, Aug. 30, 1936, *O'Neill* 8508 (GH).

ORANGE WALK DISTRICT: Honey Camp, Dec. 1928, *Lundell* 152 (F).

STANN CREEK DISTRICT: Generally on *Annona glabra* in swampy ground, Stann Creek Railway 11 mile, April 3, 1929, *Schipp* 114 (BM, F, GH, NY, US). On pine tree, Melinda Pine Ridge, Jan. 1937, *Gentle* 1936 (MICH). Epiphyte, Stann Creek Valley, Baboon Ridge, Jan. 20, 1940, *Gentle* 3145 (GH, MO, NY).

HONDURAS:

ATLÁNTIDA: On tree, Lancetilla Valley, near Tela, alt. 20–600 m., Dec. 1927–Mar. 1928, *Standley* 52694, 54343 (F, GH, US); 54610 (F, US). La Fragua, alt. 20 m., Feb. 7, 1928, *Standley* 55726 (GH, US). On tree, valley above Lancetilla, alt. 30 m., July 17, 1934, *Yuncker* 4627 (F).

NICARAGUA:

MANAGUA OR CHONTALES: Camoapa to Granada, April 1938, *Garnier* 1836 (GH).

COSTA RICA:

GUANACASTE: On tree, vicinity of Tilarán, alt. 500–650 m., Jan. 10–31, 1926, *Standley & Valerio* 44269 (US). Los Ayotes, alt. 600–700 m., Jan. 21, 1926, *Standley & Valerio* 45619 (US).

PUNTARENAS: Coto, sea level, Feb. 17, 1933, *Valerio* 366 (F).

- ALAJUELA: Epiphyte in clump, Caribbean rain forest, Villa Quesada, Canton San Carlos, alt. 950 m., April 15, 1939, *A. Smith* F-1946 (F).
- LIMÓN: Mar. 1924, *Alfaro* 36623 (US). On tree, vicinity of Guápiles, alt. 300-500 m., Mar. 12, 13, 1924, *Standley* 37521 (US). On tree, Finca Montecristo, on the Río Reventazón below Cairo, alt. ca. 25 m., Feb. 18, 19, 1926, *Standley & Valerio* 48964, 49018 (US). Hamburg Finca, alt. ca. 55 m., Feb. 19, 1926, *Standley & Valerio* 48909, 48924 (US).
- SAN JOSÉ: Forest along Río Paquita, alt. 1-3 m., Aug. 13, 1936, *Dodge & Goerger* 9765 (GH, MO).
- PANAMA: Mar. 1905, *Cowell* 412 (NY, US).
- BOCAS DEL TORO: Vicinity of Chiriquí Lagoon, May 17, 1940, *Wedel* 130 (MO); Oct. 23, 1940, *Wedel* 1330 (GH, MO, US); July 13, 1941, *Wedel* 2537 (GH, MO); Sept. 6, 1941, *Wedel* 2622 (MO). Epiphyte, Water Valley, Sept. 6, 1940, *Wedel* 646 (GH, MO). Epiphytic, vicinity of Santa Fé, forested slopes of Cerro Tute, alt. 750 m., Mar. 25, 1947, *Allen* 4398 (US).
- COCLÉ: Vicinity of Penonomé, Feb.-Mar. 1908, *R. S. Williams* 609 (NY, US). Region north of El Valle, alt. 1,000 m., Sept. 18, 1946, *Allen* 3689 (MO).
- CANAL ZONE: Las Cascadas Plantation, near Summit, Dec. 2, 1923, *Standley* 25754 (US); Jan. 4, 1924, 29665, 29690 (US). Balboa, Nov. 1923-Jan. 1924, *Standley* 28569 (US). Brazos Brook Reservoir, Sept. 1924, *Stevens* 717 (US). Barro Colorado Island, 1925, *Standley* 40878 (US); 1931, *Aviles* 27 (F); *Bailey* 371 (Bailey Hort.); *Shattuck* 154 (F); 521 (F). Near Madden Dam and along Azote Caballo Road near Alajuela, alt. 90-100 m., Nov. 27, 1934, *Dodge* 16581 (MO). Westerly arm of Quebrada Salamanca, alt. 70 m., Dec. 16, 1934, *Dodge, Steyermark, & Allen* 16581a (GH, MO).
- CUBA:
- ISLE OF PINES: On tree, vicinity of Sigüanea, Feb.-Mar. 1916, *N. L. & E. G. Britton & Wilson* 14366 (NY, US).
- PINAR DEL RÍO: On trees, edge of savanna, Hato del Medio and Retiro, *C. Wright* 3272 (GH, MO, US). On tree, vicinity of Buenaventura, Dec. 18, 20, 1910, *Wilson* 9387 (NY). Corrientes Bay, Mar. 10, 11, 1911, *Britton & Cowell* 9882 (NY). On live oak, Los Palacios to San Pablo de las Yeguas, Jan. 26, 1912, *Shafer* 11915 (NY). Dry rocks, La Guira, north of Sumidero, Aug. 17, 1912, *Shafer* 13755 (NY).
- HABANA: Santa Catalina, Oct. 16, 1905, *Van Hermann* 3238 (POM); Jan.-Feb. 1907, *Caldwell & Baker* 7087 (F, POM).
- MATANZAS: On low shrub, San Miguel de los Baños, Dec. 17, 18, 1931, *Killip* 13891 (US).
- LAS VILLAS (SANTA CLARA): Sandy savanna near Monazo, Dec. 29, 1915, *León & Cazanias* 5961 (NY). On tree, Milpa, Cienfuegos Bay, Feb. 21, 1930, *Jack* 7671 (GH).
- CAMAGÜEY: On *Tecoma*, vicinity of La Gloria, Feb. 6, 1909, *Shafer* 314 (F, NY, US). On trees, savannas near Camagüey, April 2-7, 1912, *N. L. & E. G. Britton & Cowell* 13268 (NY).
- ORIENTE: On bushes, Holguín to Cacocum, April 6, 1909, *Shafer* 1843 (F, NY, US). Arroyo del Medio above the falls, Sierra de Nipe, alt. 450-550 m., Jan. 1910, *Shafer* 3329 (NY, US). Thickets 5 km. southwest of Woodfred, Sierra de Nipe, July 1941, *Howard* 6078, 6190 (GH). On shrubs in dry pasture, Río Yao, April 29, 1943, *Marie-Victorin* 60035 (GH).

SAN DOMINGO:

SAMANÁ: On trees, limestone crag, Cordillera Central, Los Haitises, Boca del Infierno, June 24, 1930, *Ekman* H-15411 (S).

JAMAICA:

SURREY: Hope River, alt. 450 m., Jan. 21, 1888, *Eggers* 3470 (GH). On tree, near Port Antonio, June 16, 1897, *Fredholm* 3016 (US).

MIDDLESEX: On stone wall, Gricerfield near Moneague, April 3, 1908, *Britton* 2643 (NY). Vicinity of Mandeville, Feb. 15-26, 1910, *Brown* 175 (NY).

CORNWALL: On trees, Troy, Cockpit Country, Sept. 13-18, 1906, *Britton* 473 (NY).

PUERTO RICO: Mayaguez, 1913, *Hess* 588 (NY).

LESSER ANTILLES:

GUADELOUPE: On trees, Camp Jacob, Deshayes, 1893, *Duss* 3316 (NY, US). On *Cocos nucifera*, edge of forest, Sofaia, alt. 400 m., Dec. 12, 1936, *Stehlé* 1537 (US).

TOBAGO: *Broadway* 4287 (BM, F, NY). Near Frenchfield, Oct. 23, 1889, *Eggers* 5570 (GH).

TRINIDAD: 1877-80, *Fendler* 823 (BM). On small tree, Erin, Mar. 13, 1908, *Broadway* 2196 (F). Tamana, 1915, *Broadway* 7895 (TRIN). Moruga, Edward Trace, 1916, *Broadway* 8205 (TRIN). On *Theobroma*, Tabaquite, Oct. 14, 1918, *Broadway* (GH, NY). Quare River forests, Jan. 21, 1931, *Broadway* (GH).

SURINAME: Forest of the Agricultural Experiment Station, Paramaribo, April 11, 1916, *Samuels* (US).

BRITISH GUIANA:

NORTHWEST DISTRICT: Amakura River, latitude 8°10' N., longitude 60° W., 1923, *Cruz* 3571 (NY, US).

POMEROON DISTRICT: Pasanalley Island, 1921, *Cruz* 1085 (NY).

DEMERARA: Demerara River, *Jenman* 6245 (Jenman, NY); April 1923, *Persaud* 186 (F). Malali, Demerara River, latitude ca. 5°35' N., Oct.-Nov. 1922, *Cruz* 2741 (F, GH, NY, US).

ESSEQUEBO: Kaieteur Falls, 1872, *Appun* (BM). Tumatumari, Potaro River, 1921, *Gleason* 404 (NY). Vicinity of Bartica, Essequibo River, latitude 6°25' N., 1922, *Cruz* 2027 (NY). Upper Mazaruni River, longitude ca. 60°10' W., Sept.-Oct. 1922, *Cruz* 2033, 2181, 2297, 2398 (F, GH, MO, NY, US). Kamakusa, upper Mazaruni River, longitude ca. 59°50' W., Nov. 23-29, 1922, *Cruz* 2806 (F, GH, MO, NY, US). From Sapodilla tree, river tidal flats, Mazaruni Forest Station, Potaro River Gorge, May 23, 1944, *Maguire & Fanshawe* 23580 (GH, NY, US).

VENEZUELA:

DELTA AMACURO TERRITORY: On trees, Caño Pedernales, July 18, 1917, *Curran & Haman* 1353 (GH).

ANZOÁTEGUI: Woods along Río Leon by Quebrada Danta, tributary to Río Neverí, northeast of Bergantín, alt. 500 m., Feb. 20, 1945, *Steyermark* 61041 (F, GH).

BOLÍVAR: Epiphyte, dense forest, Río Paragua, Salto de Auraima, alt. 275 m., April 10, 1943, *Killip* 37369 (GH, US). Salto Guaiquinima, Río Paragua, April 1943, *Cardona* 493 (US).

COLOMBIA:

NORTE DE SANTANDER: Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1654 (GH), 1655 (GH, US).

SANTANDER: Vicinity of Puerto Berrio, between Carare and Magdalena Rivers, alt. 100–700 m., Aug. 11, 1935, *Haught* 1879 (GH, US).

ANTIOQUIA: On trees, open woods, near Dabeiba and the right bank of the Río Sucio, alt. ca. 1,350 m., Dec. 20, 1947, *Gutiérrez & Barkley* 17C487 (US).

EL VALLE: Epiphytic, mangrove thicket along bay, Buenaventura, alt. 0–5 m., May 7, 9, 1922, *Killip* 5228 (GH, NY, US); April 13, 1939, *Killip* 34970 (GH, US). Punta Arenas, north shore of Buenaventura Bay, June 2, 1944, *Killip & Cuatrecasas* 38625 (GH, US).

NARIÑO: "Prov. de Barbacoas," May 1853, *Triana* 1306 (BM, Hb. Nac. Colomb.). Barbacoas, alt. 800 m., *Triana* 551 (US).

BRAZIL: *Blanchet* 1467 (BM).

PARÁ: Epiphyte, sandy coast, Ilha do Mosqueiro, near Pará (Belém), Nov. 3–9, 1929, *Killip & Smith* 30477 (NY, US), 30553 (GH, NY, US). On trees, Lagoa Agua Preta, Municipio de Belém, June 29, 1935, *Drouet* 1946 (F, GH). Epiphyte, south forest of Instituto Agronomico do Norte, Belém, Nov. 16, 1942, *Archer* 7828 (US).

PERNAMBUCO: Beach, Iguarassú, Oct. 7, 1887, *Ridley, Lea, & Ramage* (BM).

BAÍA: In trees, Agua Preta, alt. 240 m., June 3, 1939, *Foster* 72 (GH).

Much like *Tillandsia pruinosa*, *T. bulbosa* achieves a very wide distribution but at consistently low altitudes and usually near the coast. The striking and varied coloring of the leaves is almost entirely lost in dried specimens. However, the abrupt transition from leaf-sheath to blade and the close fine scales make the identity of the species fairly certain even in sterile specimens.

6. *Tillandsia* (*Tillandsia*) *caput-medusae* E. Morr. Belg. Hortic. 30: 90. 1880.

FIGURE 51

Tillandsia langlassei Poisson & Menet, Bull. Mus. Hist. Nat. Paris 14: 237. 1908.

Stemless, 15–25 cm. high or rarely up to 4 dm.; leaves often exceeding the inflorescence, covered with coarse pale slightly spreading scales; sheaths broadly ovate or elliptic, large, strongly inflated, forming an ovoid pseudobulb, merging gradually into the blades; blades linear-triangular, acuminate, involute-subulate, usually much contorted, up to 15 mm. wide; scape erect or ascending, slender; scape-bracts densely imbricate, foliaceous; inflorescence simple or digitately compound from 2–6 spikes; primary bracts broadly ovate, usually smaller than the floral bracts and with little or no blade, lepidote; spikes sub-erect to spreading, often curved, linear-lanceolate, acute, up to 18 cm. long, 6–12-flowered with several reduced sterile bracts at the base; rhachis nearly straight, slender, angled, glabrous; floral bracts sub-erect or divergent, imbricate, ovate-lanceolate, obtuse but the apex often inrolled so that it appears acute, ecarinate, up to 2 cm. long, equaling or slightly exceeding the sepals, barely more than twice as long as the internodes and exposing the rhachis, chartaceous, prominently nerved, nearly or quite glabrous, red, pink, and green; flowers

subsessile; sepals oblong, obtuse, subcoriaceous to chartaceous, prominently nerved, glabrous, the posterior ones somewhat connate; petals linear, erect, 3–4 cm. long, violet; stamens and pistil exserted; capsule slenderly cylindrical, 3–4 cm. long.

TYPE LOCALITY: Mexico. Type described from live cultivated material and now represented by only an unpublished sketch in the Kew Herbarium.

DISTRIBUTION: Mexico to Costa Rica.

MEXICO: Xochicalco, April–May 1866, *Hahn* (P).

SONORA: Sierra de Alamos, near Alamos, Mar. 18, 1910, *Rose, Standley, & Russell* 13061 (US).

CHIHUAHUA: Barranca de Wa-pajeachi, May 1893, *Hartmann* 547 (GH).

Western Chihuahua, Barranca Legion, Sierra Madre, *Hewitt* B (GH).

SINALOA: Foothills of the Sierra Madre, near Calomas, July 18, 1897, *Rose* 1799 (US). Vicinity of Rosario, April 14, 1910, *Rose, Standley, & Russell* 14503 (NY, US). San Juan, 1921, *Ortega* 4122 (US).

DURANGO: Epiphytic, Ojito, above Corral de Piedra on Río Piaxtla, alt. 1,500 m., April 12, 1943, *Lundell* 13010 (GH, Lundell).

NAYARIT: Hills west of Ahuacatlán ("Agua Catlan"), May 27, 1849, *Gregg* 995 in part (MO). On trees by Puga road 1 mile from Tepic, Nov. 5, 1925, *Ferris* 5789 (DS).

JALISCO: On *Ficus*, barranca near Guadalajara, June 25, 1892, *Pringle* 5334 in part (F, GH, MO, NY, POM).

VERA CRUZ: Zacuapan, 1929, *Skwarra* (GH, US).

MORELOS: Cuernavaca, alt. 1,500 m., April 9, 1923, *Reko* 4663 (US). Cuernavaca, June 25, 26, 1923, *Skwarra* s. n., 17 (GH). In valley, San Antonio, near Cuernavaca, alt. 1,600 m., Feb. 2, 1932, *Fröderström & Hullén* 1331 (S). On trees, Malpaís "El Tezcal," northeast of Cuernavaca, alt. 1,550 m., May 30, 1939, *Nagel* 8020 (GH).

MÉXICO: Epiphytic, Tejupilco, Temascaltepec District, alt. 1,340 m., May 25, 1932, *Hinton* 689 (GH, K). Pantoja, alt. ca. 1,500 m., Dec. 3, 1932, *Hinton* 2856 (K, NY). On a "Ciruelo," Pungaracho, April 6, 1933, *Hinton* 3750 (K).

FEDERAL DISTRICT: Mexico City, 1900, *Herrera in hb. Rose* 147 (US).

GUERRERO: Epiphytic, Providencia, alt. 900 m., April 29, 1899, *Langlassé* 1013 bis (K, type collection of *Tillandsia langlassei* Poison & Menet). Epiphytic, Taxco Viejo, April 28, 1936, *Abbott* 130 (GH). Epiphytic, cut-over hillside at Km. 338.3 beyond Acahuizotla on highway to Acapulco, alt. ca. 900 m., Aug. 20, 1948, *Moore & Wood* 4687 (US).

OAXACA: Pinotepa, May 1844, *Galeotti* 4919B (US). Chivela, April 16, 1910, *Orcutt* 3300 (F, GH, MO, US).

CHIAPAS: Monserrate, *Purpus* 10197 (US). Chicomucelo, alt. 800 m., July 14, 1941, *Matuda* 4509 (Lundell). Fraylesca, near Siltepec, alt. 2,000 m., Mar. 13, 1945, *Matuda* 5279 (GH). Tuixcum, near Mozintla, alt. 2,416 m., May 16, 1945, *Matuda* 5537 (GH). Epiphytic, dry rocky hills, vicinity of Ocozocuahtla, April 10, 1947, *Moore* 2542 (US).

GUATEMALA:

ALTA VERAPAZ: On tree, along Río Polochic, near Pancajché, alt. ca. 900 m., April 10, 1941, *Standley* 91923 (F).

EL PROGRESO: Epiphytic, hills around Baranquillo, alt. 650 m., May 17, 1942, *Steyermark* 46438 (F, GH).

GUATEMALA: Lake Amatitlán, alt. 1,170 m., Mar. 1890, *J. D. Smith* 1951 (US). Between Amatitlán and Palín, Mar. 26, 1922, *Greenman* 5844

- (GH, MO). On *Ficus*, Lake Amatitlán, alt. 1,200 m., April 17, 1937, *Muenschler* 12367 (F). On tree, vicinity of Lake Amatitlán, alt. 1,255 m., Mar. 15, 1941, *Standley* 89544 (F, GH).
- RETALHULEU: On tree, along Río Samalá, on road between San Sebastián and Santa Cruz Muluá, alt. 330 m., Feb. 23, 1941, *Standley* 88149 (F, GH).
- ESCUINTLA: Escuintla, alt. ca. 330 m., Mar. 1890, *J. D. Smith* 2010 (GH, NY, US). On tree, between Río Jute and Río Pantaleón on road between Escuintla and Santa Lucia Cotz, alt. 540–720 m., Jan. 24, 1939, *Standley* 63494 (F). On tree, along Río Guacalate, northwest of Escuintla, alt. ca. 700 m., Mar. 14, 1941, *Standley* 89327, 89399 (F). On tree, south of Río Burrión, northeast of Escuintla, alt. ca. 700 m., Mar. 16, 1941, *Standley* 89633 (F, GH).
- SANTA ROSA: San Juan Utapa, alt. 1,350 m., June 1893, *Heyde & Lux in hb. J. D. Smith* 4643 (US).
- JUTIAPA: On tree, between Jutiapa and La Calera, southeast of Jutiapa, alt. ca. 850 m., Nov. 2, 1940, *Standley* 76155 (F).
- HONDURAS: On *Crescentia*, west coast, April 1931, *Bates* 2 (GH).
- MORAZÁN: Río la Orilla, alt. 800 m., Aug. 1943, *Rodriguez* 239 (F). On tree, Quebrada de Santa Clara, near Río Yeguaré, alt. ca. 800 m., Dec. 17, 1946, *Standley & Williams* 1603 (F).
- ATLÁNTIDA: On tree, foothills back of Ceiba, July 23, 1938, *Yuncker, Koepper, & Wagner* 8609 (F, GH, MO, NY, US).
- EL PARAISO: Region of Quebrada de Dantas, 5 km. south of Ojo de Agua, alt. ca. 750 m., Dec. 11, 1946, *Standley, Williams, & Molina* 1303a (F).
- EL SALVADOR:
- SANTA ANA: Volcán de Santa Ana, alt. 1,590–2,340 m., Feb. 19, 1946, *Carlson* 1069 (F).
- SONSONATE: On tree, vicinity of San Antonio del Monte, alt. ca. 250 m., Mar. 23, 1922, *Standley* 22148 (GH, NY, US). On tree, vicinity of Izalco, Mar. 1922, *Standley* 22185 (GH, US).
- SAN SALVADOR: Vicinity of San Salvador, *Renson* 321 (NY, US).
- SAN VICENTE: Vicinity of San Vicente, alt. 350–500 m., Mar. 2–11, 1922, *Standley* 21158 (US).
- NICARAGUA: *Garnier* 2007 (GH).
- COSTA RICA:
- GUANACASTE: Wooded hills of Nicoya, Dec. 1899, *Tonduz* 13648 (BM, US). On *Crescentia*, common, Las Cañas, alt. ca. 40 m., Feb. 2, 1926, *Standley & Valerio* 46672 (US).
- ALAJUELA: On tree, El Coyolar, alt. ca. 240 m., April 1–3, 1924, *Standley* 39984, 40072 (US).
- SAN JOSÉ: San José, alt. 1160 m., Oct. 1908, *Wercklé* 17471, 17475 (GH). On tree, Río Tirribí, near San José, Feb. 10, 1924, *Alfaro* 33972 (US).

7. *Tillandsia* (*Tillandsia*) *circinnata* Schlecht. *Linnaea* 18: 430. 1844.

FIGURE 52

Tillandsia bulbosa sensu Chapm. Fl. South. U. S. 471. 1860. Not Hook. 1826.

Tillandsia paucifolia Baker, Gard. Chron. II. 10: 748. 1878.

Tillandsia yucatanana Baker, Journ. Bot. Brit. & For. 25: 280. 1887.

Tillandsia pruinosa sensu Chapm. Fl. South. U. S. ed. 3, 498. 1897. Not Sw. 1797.

Tillandsia intermedia Mez, Bull. Herb. Boiss. II. 3: 141. 1903.



FIGURE 52.—*Tillandsia circinnata*: a, Habit, $\times 1/2$; b, flower, $\times 1$; c, proliferating plant, $\times 1/4$.

Stemless and 10–45 cm. high or pseudocauliscent by repeated proliferation of the inflorescence and several meters long; leaves thick, covered throughout with coarse closely appressed cinereous scales; sheaths large, broadly ovate, forming a narrowly ovoid or ellipsoid pseudobulb 5–15 cm. long, merging gradually into the blades, the

outer ones much reduced and bladeless; blades involute-subulate, pungent, up to 2 dm. long but often much shorter even on a large plant, 3–7 mm. in diameter, curved or contorted or coiled; scape erect; scape-bracts erect, imbricate, foliaceous with spreading or recurved-coiling blades; inflorescence simple or digitately or pinnately compound from a few spikes; primary bracts like the scape-bracts, always somewhat shorter than the axillary spikes but their blades often exceeding them; spikes erect or suberect, linear-lanceolate, acute, often curved, up to 12 cm. long but normally much smaller, 2–10-flowered; floral bracts erect, imbricate, elliptic, acute, nearly or quite ecarinate, 2–3 cm. long, exceeding the sepals, two to three times as long as the internodes, subchartaceous, nerved, densely pale-appressed-lepidote; flowers sessile; sepals lance-oblong, acute, about 2 cm. long, subchartaceous, glabrous or sparsely lepidote, nerved, the posterior ones more or less connate; petals linear, erect, to 4 cm. long, violet; stamens and pistil exserted; capsule slenderly cylindrical, 4 cm. long.

TYPE LOCALITY: Near Hacienda de la Laguna, Vera Cruz, Mexico. Type collected by Schiede.

DISTRIBUTION: Southern Florida, Bahamas, Cuba, Hispaniola, Mexico, Central America, Colombia.

UNITED STATES:

FLORIDA: South Florida, *Chapman* (NY). On *Rhizophora*, southern border of the Everglades, Jan. (1882), *Curtiss* 2845 (BM, F, GH, MICH, MO, NY, US). Tamiami Trail, between Miami and Tampa, June 14, 1941, *Foster* 1158 (GH).

BROWARD COUNTY: On *Taxodium distichum*, west of Pompano, Jan. 19, 1930, *Moldenke* 486 (MO, NY). Epiphytic in hammock, 6 miles west of Davis, Jan. 30, 1940, *Seibert* 1173 (MO).

DADE COUNTY: Miami, May 1877, *Garber* (F, GH, US). On mangroves, Miami River, July 10, 1895, *Curtiss* 5466 (GH, MO, NY, US). Miami, Oct.–Nov. 1901, *Small & Nash* 39 (NY). Old Rhodes Key, Nov. 6, 7, 1901, *Small & Nash* (NY). Hammocks, Adams Key, Mar. 11, 1915, *Small & Mosier* 5740 (NY, US). Goodburn Hammock, Mar. 17, 1915, *Small & Mosier* 5933 (NY). Trees, Sykes Hammock, Sept. 1925, *Small* (GH).

MONROE COUNTY: Key West, *Blodgett* (NY), 1843, *Blodgett* (GH); 1841–46, *Rugel* 105 (BM, F, MO, NY, US). Sugar Loaf Key, Mar. 17, 1898, *Pollard, Collins, & Morris* 100 (BM, F, NY, US). Hammocks, lower portion of Key Largo, Jan. 10, 11, 1909, *Small & Carter* 3118 (NY). On tree in hammock, Big Pine Key, Mar. 1, 1936, *Killip* 31691 (GH). On *Bumelia angustifolia*, Big Pine Key, Feb. 4, 1940, *Seibert* 1264 (MO).

MEXICO: 1849, *Strickland* (BM).

SINALOA: Vicinity of Mazatlán, Mar. 31, 1910, *Rose, Standley, & Russell* 13791 (NY, US).

NAYARIT: Epiphyte hanging from trees, María Madre, Tres Marias Islands, May 17, 1925, *Mason* 1742 (DS, US); May 16, 1925, *Mason* 1719 (US); May 20, 1925, *Solis* 15 (US); same, Arroyo Honda, May 18, 1925, *Mason* 1765 (F, GH, NY, US). Vicinity of San Blas, Oct. 2, 1925, *Ferris* 5342 (DS).

VERA CRUZ: Hacienda de la Laguna, *Schiede* (Berlin, type). Carrizal, May 12–14, 1901, *Goldman* 716 (US). Acasonica, Aug. 1919, *Purpus* 8465 (US). Tamarindo, May 31, 1929, *Skwarra* 16 (GH).

COLIMA: Almost scandent by the coiled leaves, proliferously compound, abundant about Manzanillo, *Trelease* (MO). Pendent from bushes, east side of Manzanillo Bay, vicinity of Manzanillo, Dec. 1, 1925, *Ferris* 6205 (DS, US). Epiphyte on *Ficus*, near sea level near road one-half mile southeast of Manzanillo, Aug. 8, 1938, *Eyerdam & Beelle* 8701 (GH, US).

GUERRERO: Epiphytic, Zihuetenango, near sea level, Sept. 26, 1898, *Langlassé* 370 (F, GH, US, type collection of *Tillandsia intermedia* Mez; Geneva, type, Macbride photo No. 25263). Cliffs and steep bluffs with low scrub above river in Cañon del Zopilote, just north of Venta Vieja, Km. 263 on highway between Chilpancingo and Mexcala, alt. ca. 600 m., Aug. 23, 1948, *Moore & Wood* 4740 (US).

YUCATÁN: Mérida, Mar. 20, 1865, *Schott* 250 (BM, type of *Tillandsia yucatanica* Baker); July 11, 1865, *Schott* 842 in part (F); July 1865, *Schott* 891 (F).

GUATEMALA:

ZACAPA: On tree, dry rocky slopes in vicinity of Río Hondo, alt. 250–350 m., Oct. 9, 1939, *Steyermark* 29374 (F). On tree, near La Fragua, alt. 200–500 m., Oct. 14, 1940, *Standley* 74796 (F).

CHIQUMULA: On tree, between Ramfrez and Cumbre de Chiquimula, on road between Chiquimula and Zacapa, alt. 400–600 m., Oct. 15, 1940, *Standley* 74488 (F).

HONDURAS:

COMAYAGUA: Ajuterique, alt. 750 m., Mar. 31, 1945, *Rodriguez* 3036 (GH).

COSTA RICA:

GUANACASTE: On trees, Port Parker, latitude ca. 10°57' N., July 4, 1932, *Howell* (GH).

BAHAMAS: Clustered on trees, Fortune Island, Feb. 4, 1888, *Eggers* 3855 (BM). Purser Point, Andros Island, June 17, 1890, *Northrop* 654 (F, GH, NY). Cap Island, *Hitchcock* (F). Inagua Island, Dec. 4, 1890, *Hitchcock* (F, MO); Salt Pond Hill, Oct. 12, 1904, *Nash & Taylor* 939 (F, NY). Crooked Island, Dec. 25, 1890, *Hitchcock* (F, MO). On trees, coppice, south of Fox Hills, New Providence, Sept. 5, 1904, *Britton & Brace* 542 (F, NY). Great Bahama: on tree, coppice, Eight Mile Rocks, Feb. 5–13, 1905, *Britton & Millspaugh* 2567 (F, NY); Garden Cay, West End, April–May, 1905, *Brace* 3658 (F, NY). Andros, on shrubs, Deep Creek, Aug.–Sept. 1906, *Brace* 5172 (F, NY). Long Cay, hill above cove, Dec. 7–17, 1905, *Brace* 4215 (F, NY). Cat Island, on shrub, vicinity of the Bight, Mar. 1–6, 1907, *Britton & Millspaugh* 5834 (F, NY). Watlings Island, scrub lands, vicinity of Cockburn Town, Mar. 12, 13, 1907, *Britton & Millspaugh* 6072 (F, NY). Mariguana: Vicinity of Abraham Bay, Dec. 6–8, 1907, *Wilson* 7454 (F, NY); Southeast Point, Dec. 10–12, 1907, *Wilson* 7572 (F, GH, NY). Caicos Islands, South Caicos, Dec. 14–16, 1907, *Wilson* 7635 (F, NY).

CUBA:

PINAR DEL RÍO: Herradura, Sept. 18, 1905, *Van Hermann* 917 (POM). Jovero, San Julián, Jan. 1938, *Acuña* 10680 (Vegas).

CAMAGÜEY: Near southwestern end, Cayo Coco, Oct. 23, 1909, *Shafer* 2679 (F, GH, NY, US).

ORIENTE: 1939, *León* 1 (GH). On low trees, U. S. Naval Station, Guantánamo Bay, Mar. 17–30, 1909, *Britton* 2059 (NY). Maisí, July 8, 1938, *León* 152 (Carabia).

HARTI: Epiphytic, Île de la Gonave, Les Etruits, on road to Anse-à-Galets, edge of mud flats, Aug. 8, 1927, *Ekman* H-8851 (GH, NY, US).

NORD-OUEST: On shrub, arid mountain slope west of bay, vicinity of Port à l'Ecu, Mar. 17, 1929, *Leonard* 13871 (US).

SAN DOMINGO:

BARAHONA: Epiphyte, Valley of Neiba, alt. 50 m., Aug. 15, 1946, *Howard* 8341 (GH). Near La Salina, alt. ca. 1,000 m., Aug. 16-17, 1946, *Howard* 8367, 8383 (GH).

MONTE CRISTI: Epiphyte, elevated coral reefs near Río Yaque del Norte, south of Monte Cristi, Oct. 23, 24, 1946, *Howard* 9580 (GH).

COLOMBIA:

MAGDALENA: Epiphytic in *Pereskopsis*, semiarid section, mountains above Santa Marta, alt. 300 m., July 29, 1946, *Foster & E. Smith* 1324 (GH).

INDEFINITE: Cultivated plant of unknown origin, Oct. 1878, *Hort. Kew* (K, type of *Tillandsia paucifolia* Baker).

A curious growth-form of this species occurs in western Mexico as evidenced by *Eyerdam & Beetle* 8701, *Ferris* 6205, *Mason* 1742, and *Trelease*. The inflorescence proliferates as a new rosette repeatedly, forming a chain of plants. Figure 52, c, shows the last two members of such a chain with the terminal plant producing a true inflorescence. The tightly curved base of the simple plant in figure 52, a, indicates that the plant grew pendent, apparently a frequent situation in this species.

8. *Tillandsia* (*Tillandsia*) *baileyi* Rose ex Small, Fl. Southeast. U. S. 246, 1328. 1903. FIGURE 53

Stemless, 2-4 dm. high, growing in dense masses; leaves several in a bulbous rosette, equaling or exceeding the inflorescence, densely appressed-cinereous-lepidote throughout; sheaths ovate, relatively small, forming an ovoid pseudobulb 2-5 cm. long, passing gradually into the blades, often conspicuously ciliate-lepidote; blades contorted, linear, involute-subulate, acuminate, 5 mm. in diameter at base; scape erect or ascending, 2 mm. in diameter, cinereous-lepidote; scape-bracts like the leaves but smaller and with narrow sheaths, which are often shorter than the upper internodes; inflorescence simple or rarely of 2 spikes; primary bract like the upper scape-bracts, much shorter than the axillary spike; spikes linear, 4-10 cm. long, 12 mm. wide, subdensely 6-17-flowered, complanate, appressed-cinereous-lepidote; floral bracts suberect, loosely imbricate, ovate, acute, 2 cm. long, exceeding the sepals, about three times as long as the internodes, ecarinate, subchartaceous, prominently nerved, roseate; flowers subsessile; sepals lanceolate, acute, up to 16 mm. long, chartaceous, prominently nerved, cinereous-lepidote, short-connate posteriorly; petals ligulate, 3 cm. long, purple; stamens and pistil exserted; capsule slenderly cylindrical, 4 cm. long.

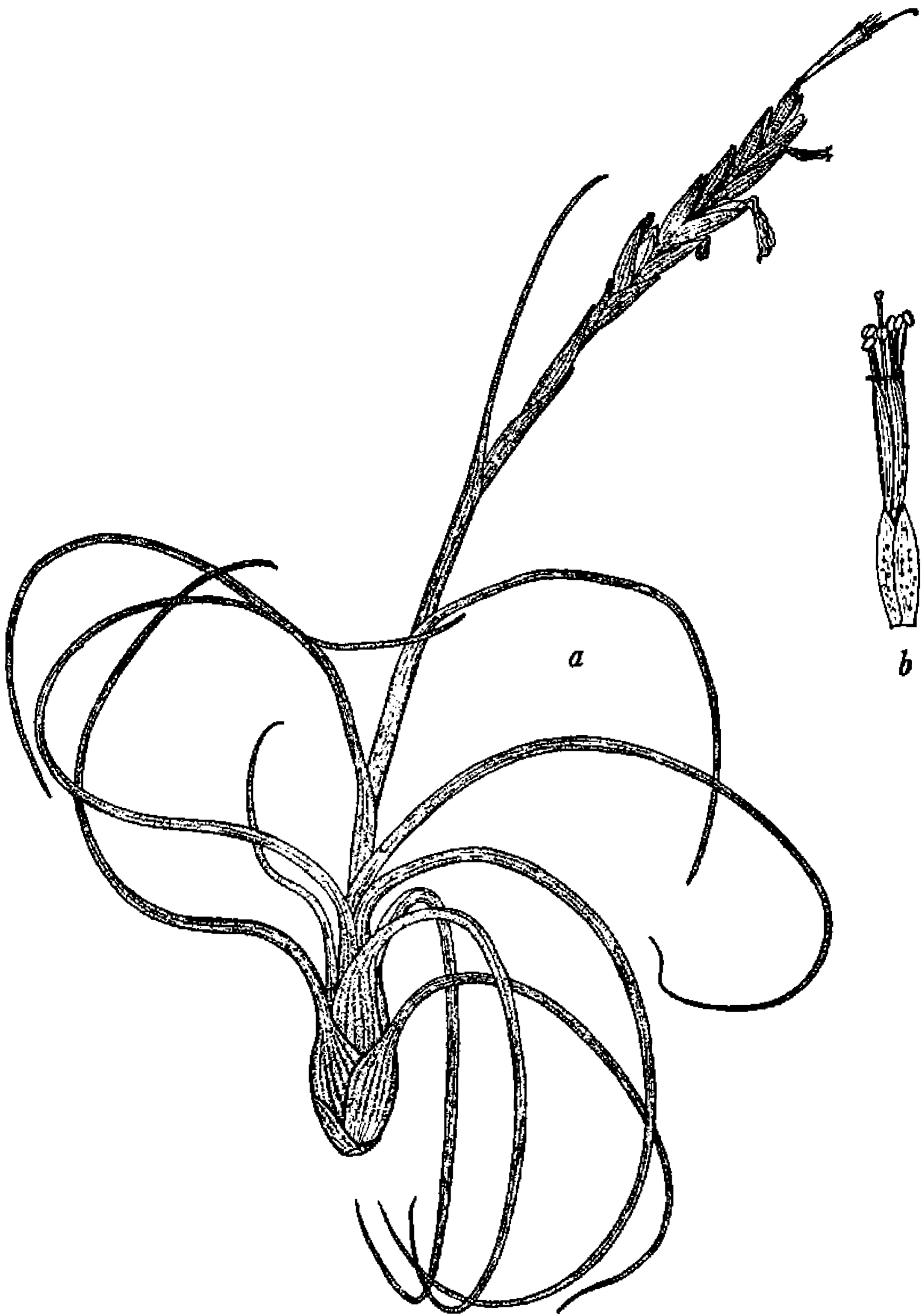


FIGURE 53.—*Tillandsia baileyi*: *a*, Habit, $\times 1/2$; *b*, flower, $\times 1$.

ILLUSTRATIONS: Lundell, Fl. Texas 3: fig. 23.

TYPE LOCALITY: Cameron County, Tex. Type collected by V. Bailey (No. 226).

DISTRIBUTION: Southern Texas, Mexico, Guatemala.

UNITED STATES:

TEXAS:

KENEDY COUNTY: 1940, *Tharp* (GH, MO). Sarita, alt. 12 m., Aug. 7, 1941, *Fisher* 41172 (F). Live oak woods, Norias Division, King Ranch, Nov. 3, 1949, *Swallen* 10605 (US).

BROOKS COUNTY: $2\frac{3}{4}$ miles south of Barroso, 1935, *Cory* 14139 (GH).

CAMERON COUNTY: San Ignacio Ranch, May 8, 1900, *V. Bailey* 226 (US, type). Brownsville, April 8, 1921, *Camp* (GH, US); Mar. 14, 15, 1923, *Tharp* 1896 (US). Olmito, Oct. 23, 1927, *Rose & Russell* 24197 (GH, US). Near Brownsville, Nov. 1927, *Runyon* (US). Port Isabel, Mar. 27, 1932, *Jones* 29079 (F, MO, POM). On mesquite tree in thicket, 7½ miles west of La Paloma, May 5, 1940, *Lundell* 8706 (GH, MICH).
 HIDALGO COUNTY: Cultivated and flowered in May, 1901, *V. Bailey* 5206 (US). Mercedes, Mar. 25, 1907, *York* 187 (DS). Two miles southwest of La Joya, Nov. 11, 1940, *Reed* 36063 (GH).

MEXICO:

TAMAULIPAS: Camargo, May 30, 1904, *Griffiths* 6494 (US). Fifty miles south of Matamoros, Dec. 1938, *LeSueur* 66 (F, GH).

VERA CRUZ (?): Huajesaron, April 23, 1929, *Skwarra* (GH).

GUATEMALA:

GUATEMALA: On tree, dry rocky thicket, near Fiscal, alt. 1,080–1,140 m., Dec. 12, 1938, *Standley* 59571 (F). On tree, on dry rocky brushy hillsides, near Fiscal, alt. ca. 1,100 m., Dec. 18, 1940, *Standley* 80349 (F, GH).

JUTIAPA: On tree, hills between Jutiapa and Plan de Urrutia, north of Jutiapa, alt. 900–1,200 m., Oct. 28, 1940, *Standley* 75487 (F, GH).

The type number of *Tillandsia baileyi* was erroneously cited as 26 instead of 226 in the original description.

9. *Tillandsia* (*Tillandsia*) *andreana* E. Morr. ex André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hort.* 60: 567. Dec. 16, 1888. FIGURE 54

Pityrophyllum andreanum E. Morr. ex André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hort.* 60: 567. Dec. 16, 1888, nomen in synonymy.

Tillandsia funckiana Baker, *Handb. Bromel.* 196. 1889.

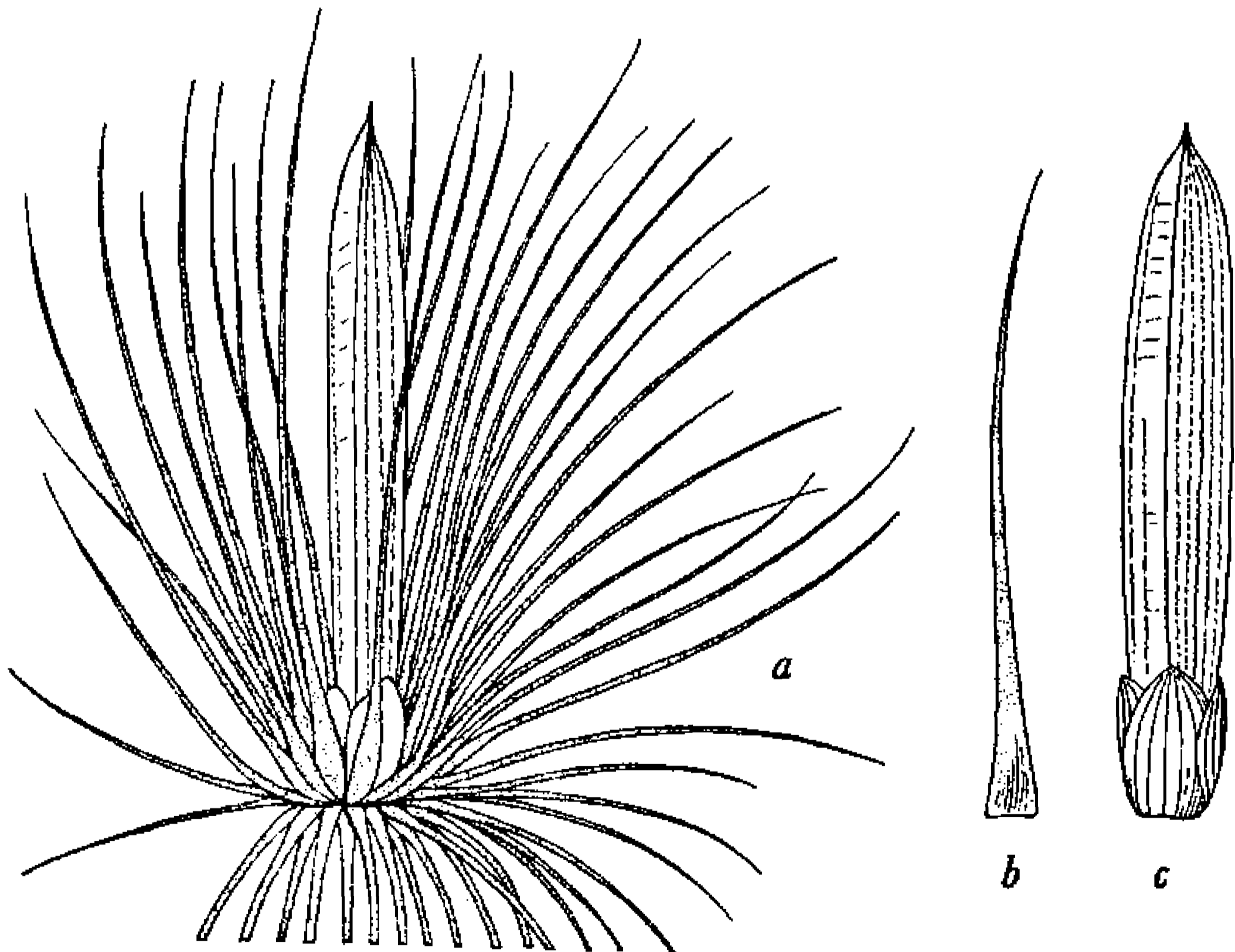


FIGURE 54.—*Tillandsia andreana*: a, Habit, $\times 1$; b, leaf, $\times 1$; c, sepals and capsule, $\times 1$, after André, *Brom. Andr.*

Plant varying from the typically stemless phase to long-caulescent; leaves scarcely more than 5 cm. long, densely lepidote throughout with appressed cinereous or brownish scales; sheaths distinct, triangular-ovate, about 5 mm. long; blades erect to recurved, linear, 1–2 mm. wide, filiform-acuminate, strongly keeled below; scape none; inflorescence terminal, consisting of a single flower or rarely two; floral bract lance-oblong, acute, membranaceous, 1-nerved, glabrous, not more than half as long as the sepals; sepals elliptic-ovate, obtuse, about 15 mm. long, chartaceous, even, glabrous, free; petals erect, up to 44 mm. long, red; stamens and pistil exserted.

ILLUSTRATIONS: *Brom. Andr. Pl. 29, fig. B*; *Proc. Amer. Acad. 70: no. 5: pl. 4, fig. 1*.

TYPE LOCALITY: On trees, Río de la Honda, near the Bridge of Icononzo, Pandi, Colombia. Type collected by André (No. 1762).

DISTRIBUTION: Venezuela, Colombia.

VENEZUELA:

MÉRIDA: Laderas de San Pablo near Mérida, alt. 500–700 m., ca. 1846, *Funck & Schlim* 1258 (BM, type of *Tillandsia funckiana* Baker; P); Río Chama, alt. 600 m., April 15, 1922, *Jahn* 1088 (GH, NY, US). El Morro, alt. 1,750 m., Jan. 14, 1911, *Jahn* 78 (US). Between Estanques and Puente Real, San Juan to El Vegon, alt. 400–1,100 m., Feb. 2, 1928, *Pittier* 12846 (NY, US). On dry perpendicular rocks at El Molino, just above Lagunillas, alt. 1,250 m., April 29, 1944, *Steyermark* 56217 (GH). Andes of Mérida, near Mérida, Jan. 1950, *Marcuzzi* (US).

COLOMBIA:

MAGDALENA: High in trees, Manaure, Sierra Perijá and Sierra de Santa Marta, alt. 1,050 m., Aug. 24, 1946, *Foster & E. Smith* 1476 (GH).

NORTE DE SANTANDER: Gramalote (Cúcuta), Dec. 1940, *Maria* 2558 (GH).

CUNDINAMARCA: On trees, Río de la Honda, near the Bridge of Icononzo, Pandi, alt. 1,640 m., Feb. 1876, *André* 1762 (K, type).

TOLIMA: Epiphytic, Río Icononzo, alt. 900 m., Oct. 13, 1946, *Foster* 1884 (GH).

Recent collections show that the distinction of caulescent against acaulescent between *Tillandsia funckiana* and *T. andreana* does not hold.

10. *Tillandsia* (*Tillandsia*) *exserta* Fernald, *Bot. Gaz.* 20: 537. 1895.

FIGURE 55

Tillandsia cinerea Mez in DC. *Monogr. Phan.* 9: 679. 1896. Not Raf. 1840.

Stemless, 2–7 dm. high; leaves many in a dense rosette, up to 3 dm. long, densely lepidote throughout with coarse pale cinerous subspreading scales; sheaths ovate, conspicuous; blades coiled-recurving, very narrowly triangular, long-acuminate, involute, 3–4 mm. in diameter at the base; scape erect, 3 mm. in diameter, glabrous; scape-bracts erect, involute, imbricate, the lower foliaceous, the upper elliptic, acute or apiculate, densely appressed-lepidote; inflorescence simple or subdigitately compound, up to 18 cm. long; primary bracts

like the upper scape-bracts, much shorter than the axillary branches; axes slender, glabrous; spikes erect or slightly divergent, linear-lanceolate, acute, 5–14 cm. long, 8–15 mm. wide, subsessile with a few sterile bracts at the base or the terminal spike sometimes stipitate,

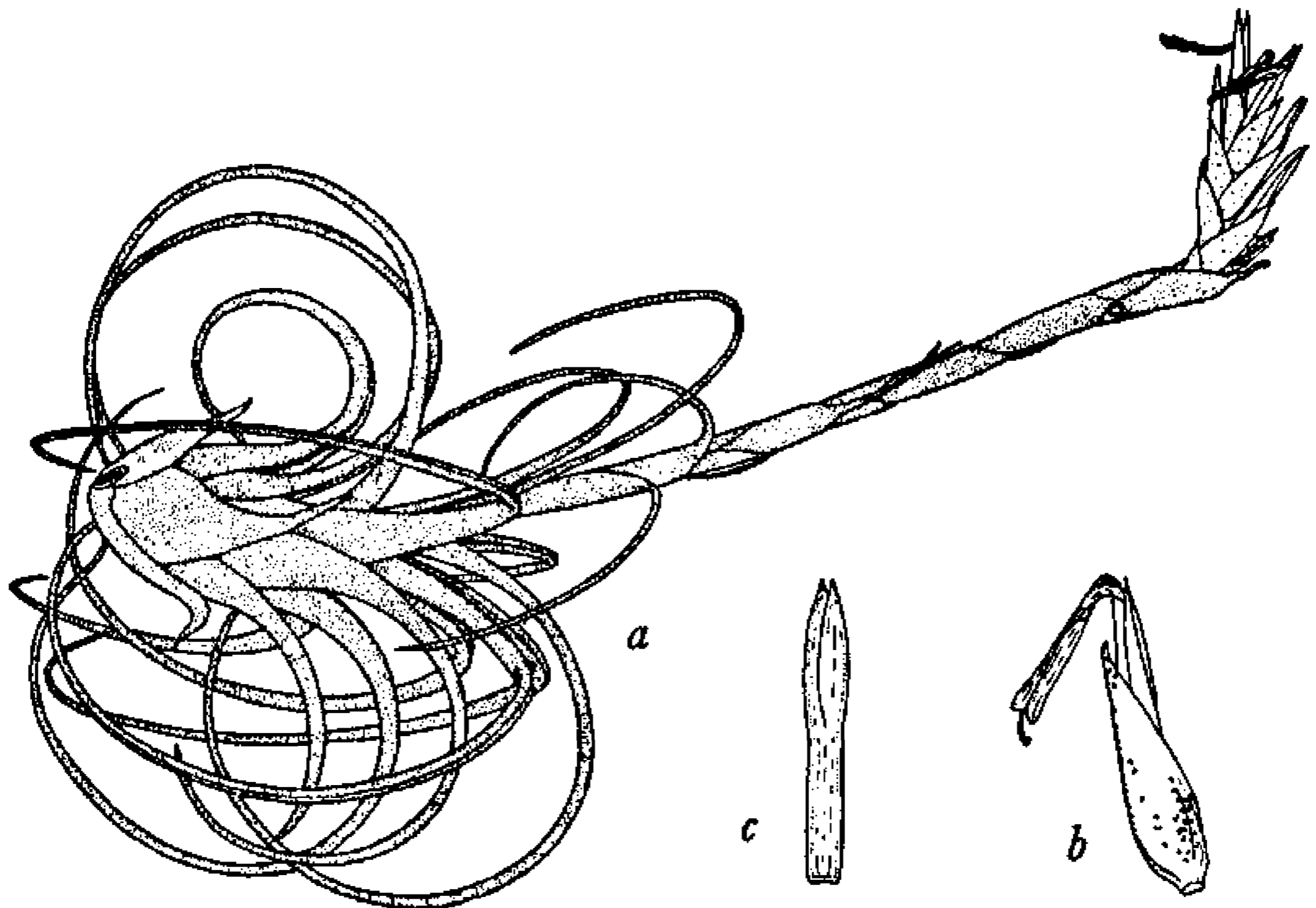


FIGURE 55.—*Tillandsia exserta*: *a*, Habit, $\times 1/2$; *b*, floral bract and flower, $\times 1$; *c*, posterior sepals, $\times 1$.

complanate, dense, about 12-flowered; rhachis angled, straight; floral bracts erect, densely imbricate, broadly ovate, acute, 2 cm. long, distinctly shorter than the sepals at anthesis, over three times as long as the internodes, straight, ecarinate, subcoriaceous, usually even except near the apex, densely appressed-lepidote, often red; flowers subsessile, erect; sepals linear-lanceolate, acute, up to 26 mm. long, carinate, coriaceous, even, connate posteriorly for about half their length; petals erect, linear, acute, 35 mm. long, violet; stamens and pistil exserted; capsule slenderly cylindric, acute, 3 cm. long.

ILLUSTRATIONS: Contr. Gray Herb. 98: pl. 4, figs. 10, 11.

TYPE LOCALITY: Mazatlán, Sinaloa, Mexico. Type collected by Lamb (No. 381).

DISTRIBUTION: Northwestern Mexico.

MEXICO:

SONORA: Agiabampo, 1890, *Palmer* 805 (GH, US, type collection of *Tillandsia cinerea* Mez).

SINALOA: Mazatlán, Jan. 2, 1895, *F. H. Lamb* 381 (GH, type; DS); Mar. 31, 1910, *Rose, Standley, & Russell* 13793 (NY, US); Nov. 1926, *Ortega* 6477 (GH, US); 1926, *Reiche* 372 (M). Altata, 1903, *Purpus* (UC). Yerba Buena, vicinity of Culiacán, Oct. 10, 1904, *T. S. Brandegee* (UC). On shrubs, vicinity of Topolobampo, Mar. 23, 1910, *Rose, Standley, & Russell* 13345 (F, GH, NY, US). Vicinity of Guadalupe, April 18, 1910, *Rose,*

Standley, & Russell 14755 (US). Villa Unión, alt. 25 m., Dec. 1921, *Ortega* 4351 (US). El Norote, alt. 10 m., 1925, *Ortega* 5929 (US). On trees, deciduous woods on rolling hills, "La Noria," Oct. 13, 1925, *Mexia* 337½ (MO, UC). Los Mochis, near San Blas, Jan. 30, 1927, *Jones* 23458 (MO, POM). Conchi, municipio of Mazatlán, Nov. 1934, *Ortega* 7452 (MO). Eighteen miles west of Culiacan, thorn forest, coastal plain, alt. 45 m., Dec. 1944, *Gentry* 7117 (GH, US).

11. *Tillandsia* (*Phytarrhiza*) *aurea* Mez, Repert. Nov. Sp. Fedde 3: 44. 1906.

FIGURE 56

Stemless, 3 dm. high; leaves forming a slightly irregular subtriculate rosette; sheaths scarcely distinct from the blades, glabrous toward base; blades narrowly triangular, acuminate, 75 mm. long,



FIGURE 56.—*Tillandsia aurea*: *a*, Habit, $\times 1/4$; *b*, inflorescence, $\times 1$; *c*, floral bract, sepals, and capsule, $\times 1$. (Drawn by R. J. Downs.)

15 mm. wide at base, uncinately recurved, coarsely pruinose-lepidote; scape erect, elongate, slender, lepidote; scape-bracts narrow, acute or the lowest laminate, mostly shorter than the internodes, submembranaceous, densely lepidote; inflorescence simple, lax, 6-flowered, 9 cm. long; axis undulate, densely lepidote; floral bracts elliptic, acute, 14 mm. long, shorter than the sepals, ecarinate, slightly incurved toward apex, submembranaceous, red-brown when dry, lepidote; flowers divergent; pedicels stout, 2.5 mm. long; sepals lanceolate, acute, about 15 mm. long, glabrous; petals yellow, the blades spreading, 1 cm. long, broadly elliptic; stamens deeply included, exceeding the pistil; capsule cylindrical, acuminate, 35 mm. long.

TYPE LOCALITY: Puccha Valley above Masín, Department of Ancash, Peru. Type collected by Weberbauer (No. 3297).

DISTRIBUTION: Known only from the type collection.

PERU:

ANCASH: Prov. Huari: On shrubs, Puccha Valley above Masín, alt. 2,600–2,700 m., July 5, 1903, *Weberbauer* 3297 (Berlin, type, Macbride photo No. 11480).

12. *Tillandsia* (*Allardtia*) *ignesiae* Mez, Bull. Herb. Boiss. II. 3: 143. 1903.

FIGURE 57

Stemless, 10–17 cm. high; leaves many in a very dense subglobose rosette, about equaling the inflorescence, densely and finely tomentose-

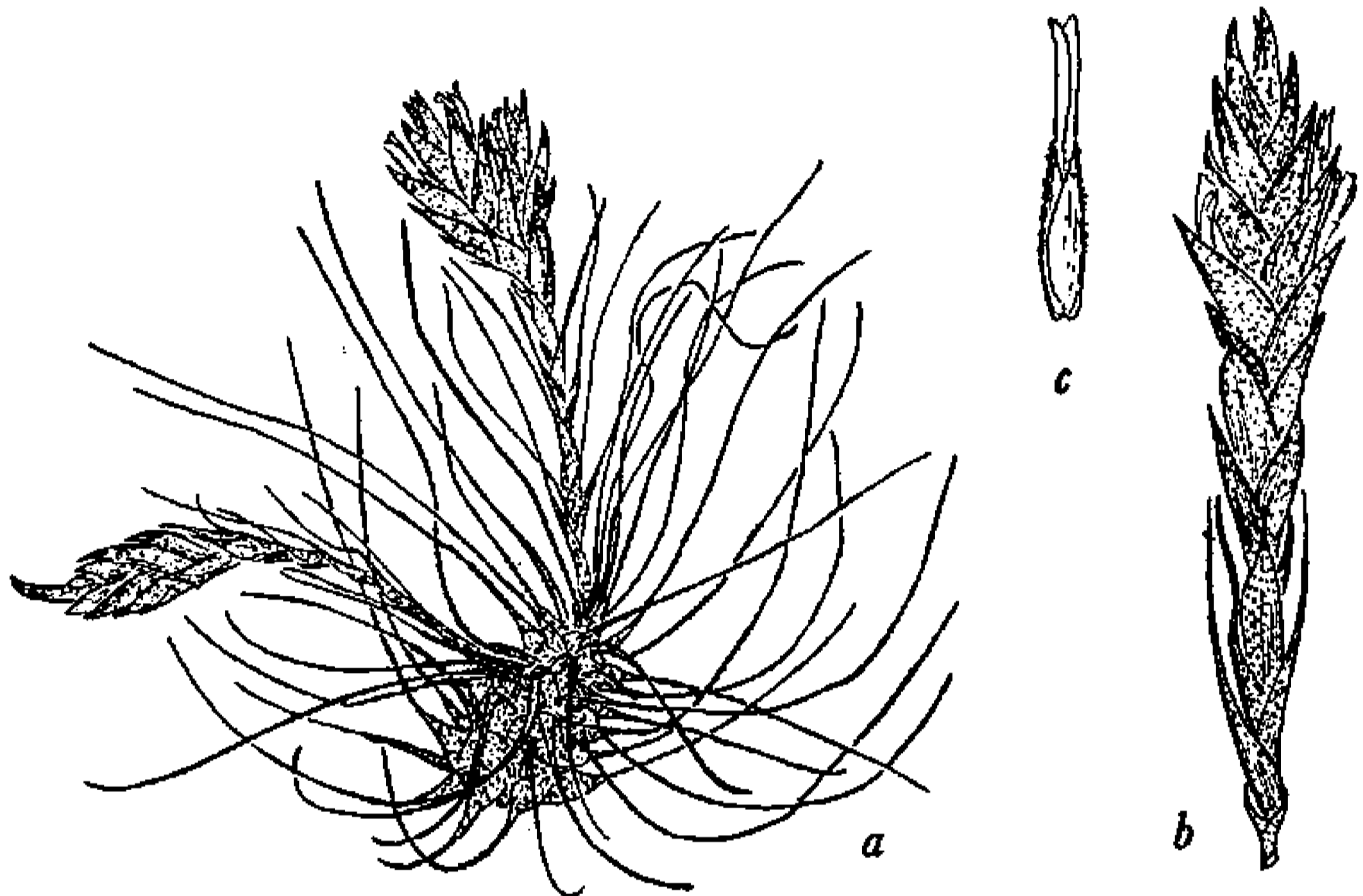


FIGURE 57.—*Tillandsia ignesiae*; a, Habit, $\times 1/2$; b, scape and inflorescence, $\times 1$; c, flower dorsal view, $\times 1$. (Drawn by R. J. Downs.)

lepidote throughout with spreading or reflexed cinereous scales; sheaths suborbicular, 8–10 mm. wide, pale; blades linear-subulate, filiform-acuminate, about 1 mm. thick, the outer ones reflexed; scape erect or ascending, very slender; scape-bracts erect, densely imbricate, elliptic with long filiform blades, membranaceous, densely lepidote; inflorescence simple, lanceolate or linear-lanceolate, acute, 25–55 mm. long, 12 mm. wide, strongly complanate, dense; floral bracts erect or slightly spreading toward apex, triangular-ovate, acuminate, up to 19 mm. long, much exceeding the sepals, four times as long as the internodes, sharply carinate, membranaceous at anthesis, somewhat indurated in fruit, prominently many-nerved, densely lepidote; flowers sessile; sepals lanceolate, acute, 12 mm. long, carinate, membranaceous, subtomentose-lepidote especially along the keel, nerved, connate posteriorly for about 1 mm.; petals ligulate, obtuse, 18 mm. long, greenish yellow when dry; stamens and pistil included; capsule cylindric, stout, short-beaked, 20–25 mm. long.

TYPE LOCALITY: Monte de Santa Igués, Michoacan, Mexico. Type collected by Langlassé (No. 93).

DISTRIBUTION: Southern Mexico.

MEXICO:

MÉXICO: District of Temascaltepec: On an oak, Nanchititla, April 10, 1933. *Hinton* 3762 (GH, K, NY, US); May 18, 1935, *Hinton* 7780 (K).

MICHOACÁN: Epiphytic, flowers from Monte de Santa Igués, fruits from Las Seneguias, alt. 1,500 m., April 4, 1908, *Langlassé* 93 (GH, P, US, type collection).

GUERRERO: District of Mina: Epiphytic, oak woods, Zacatlán, alt. 1,500 m., April 26, 1937, *Hinton* 10102 (GH, MO).

13. *Tillandsia* (? *Allardtia*) *chaetophylla* Mez in DC. Monogr. Phan. 9: 726. 1896. FIGURE 58

Tillandsia subulata E. Morr. ex Baker, Handb. Bromel. 170. 1889. Not Vell. 1825.

Stemless, 2–4 dm. high; leaves many in a dense fasciculate rosette, mostly equaling or exceeding the inflorescence, erect or variously curved, densely appressed-lepidote throughout; sheaths conspicuous, triangular, ferruginous; blades linear-subulate to filiform; scape erect or ascending, slender; scape-bracts erect, involute, densely imbricate, the lower foliaceous, the upper ovate, acute, filiform-caudate, membranaceous, pale red; inflorescence simple, lanceolate, acute, 4–8 cm. long, densely 3–8-flowered, strongly complanate; floral bracts erect, imbricate, lance-ovate, acute, 25–35 mm. long, 10 mm. wide, exceeding the sepals and about five times as long as the internodes, carinate toward the apex, densely and finely appressed-lepidote, red, membranaceous, more or less prominently nerved; flowers subsessile; sepals lanceolate, acuminate, up to 3 cm. long, chartaceous, glabrous, joined posteriorly for almost half their length; petals ligulate, obtuse, apiculate, 5–7 cm. long, violet; stamens included as far as known; pistil slightly exserted.

TYPE LOCALITY: "Mexico, loco ignoto." Type from the herbarium of Pavon without indication of the collector.

DISTRIBUTION: Southern Mexico.

MEXICO: Hb. Pavon (BM, lectotype); *Sessé & Mociño* 5443 (F); *Uhde* 182 (Berlin, type of *Tillandsia subulata* E. Morr.); Los Gallitos, (collector unknown) 272 (Liège).

VERA CRUZ: Maltrata, May 6, 1937, *Matuda* 1190 (GH, MO).

MÉXICO: District of Temascaltepec: On the oak no. 3481, La Sierrita, Mar. 7, 1933, *Hinton* 3468 (K, NY, US). District of Sultepec: Epiphytic, Almoloya, Mar. 26, 1935, *Hinton* 7449 (GH, NY).

MICHOACÁN: On tree-trunks, near Morelia, 1909, *Arsène* (GH, NY). Cerro Azul, near Morelia, alt. 2,200 m., May 5, 1910, *Arsène* 5363 (GH, US).

OAXACA: *Jurgensen* 13 (Geneva, Macbride photo No. 25259). On oaks, Coyula, April 24, 1895, *L. C. Smith* 557 (GH). District of Pochutla: Cerro de la Virgen, alt. 2,000 m., Feb. 1941, *Reko* 6213 (GH).

The lectotype of *Tillandsia chaetophylla* from the herbarium of Pavon is probably the same collection as the *Sessé* and *Mociño* material, since Pavon's Mexican specimens appear to have been largely if not entirely from this source. There is a collection of this

species purportedly made by Hioram in Puerto Rico, but the label is probably a falsification by a certain dealer in exsiccatae.

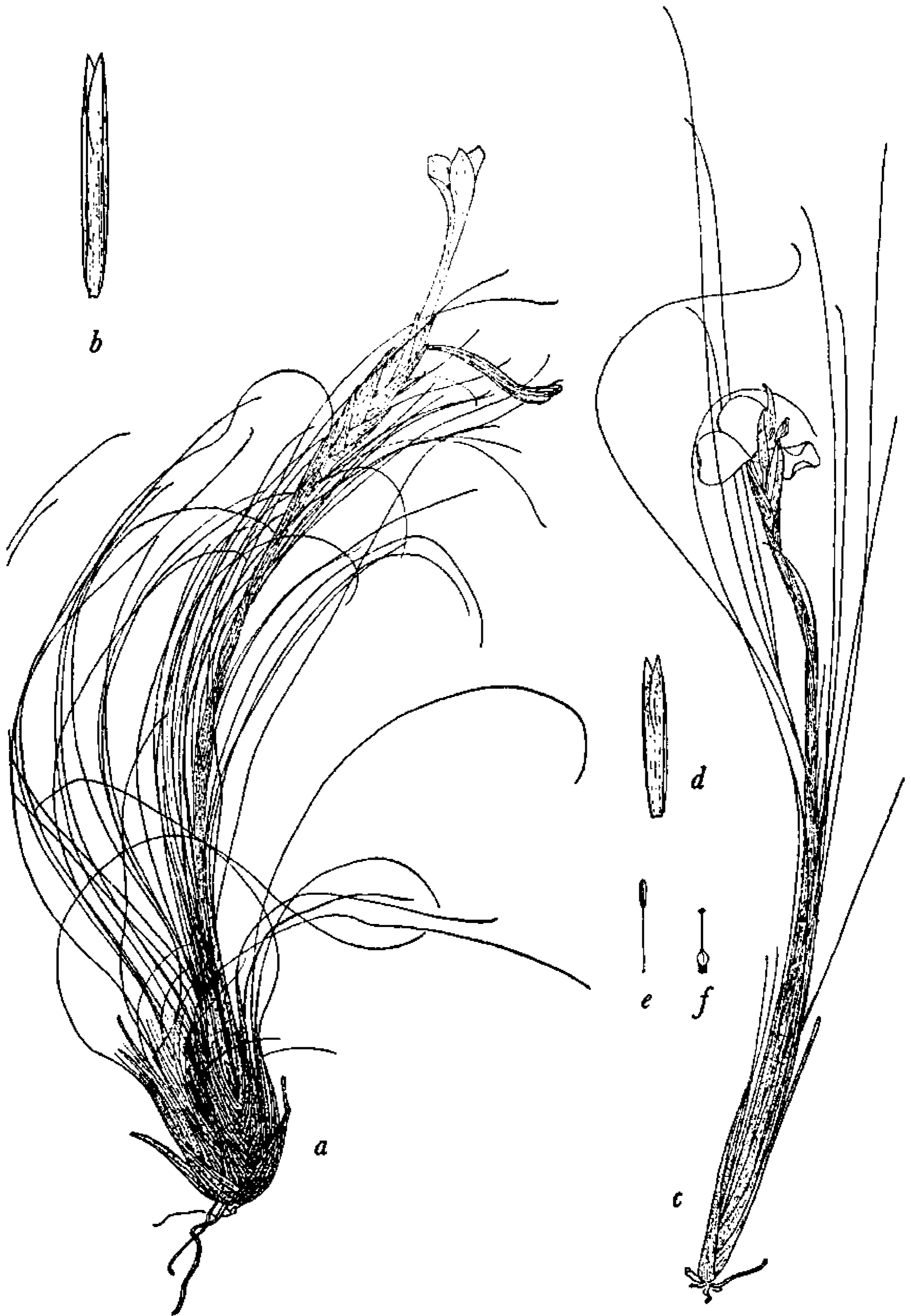


FIGURE 58.—*Tillandsia chaetophylla*: *a*, Habit, $\times 1/2$; *b*, posterior sepals $\times 1$. *Tillandsia linearis*: *c*, Habit, $\times 1/2$; *d*, posterior sepals, $\times 1$; *e*, stamen, $\times 1$; *f*, pistil, $\times 1$.

14. *Tillandsia* (Phytarrhiza) *linearis* Vell. Fl. Fluminensis 133. 1825; Icon. 3: pl. 128. 1835. FIGURE 58

Anoplophytum lineare Beer, Bromel. 42. 1857.

Tillandsia selloa K. Koch, Ind. Sem. Hort. Berol. 1873, Appendix 4: 7. 1874.

Phytarrhiza linearis E. Morr. Belg. Hort. 29: 370. 1879.

Tillandsia setacea sensu Baker, Handb. Bromel. 175. 1889, in part, as to the synonym, *T. selloa*. Not Sw. 1797.

Stemless, 13–25 cm. high; leaves about 10–20, erect or suberect, subfasciculate, up to 38 cm. long, always exceeding the inflorescence, completely covered with small appressed cinereous scales; sheaths evident, triangular; blades linear, very slender, filiform-acuminate, 1–2 mm. thick at base; scape erect, very slender; scape-bracts imbricate and wholly covering the scape, the lower ones subfoliaceous, the upper lanceolate, acute; inflorescence simple, narrowly lanceolate, strongly compressed, densely few-flowered, 30–45 mm. long, 6–10 mm. wide; floral bracts erect, imbricate and more or less covering the rhachis, elliptic, acute, about 2 cm. long, exceeding the sepals, convex but scarcely carinate, membranaceous, strongly nerved, red, lepidote; flowers sessile; sepals free, lanceolate, acuminate, up to 19 mm. long, carinate, glabrous; petal-claw linear, blade suborbicular, 10–14 mm. in diameter, spreading, violet (! Hoehne) or blue; stamens deeply included but exceeding the style; capsule slender, acute, up to 32 mm. long.

TYPE LOCALITY: No locality cited; presumably the state of Rio de Janeiro from the title "Flora Fluminensis," but it could be the state of São Paulo, which was partially covered by Vellozo.

DISTRIBUTION: Southeastern Brazil.

BRAZIL:

GOIAZ: Serra dos Veadeiros, Jan. 8, 1895, *Glaziou* 22197 (P).

RIO DE JANEIRO: Serra de Nova Friburgo, *Saldanha in hb. Schwacke* 4586 (Berlin, ! Mez).

SÃO PAULO: Santo Amaro, Nov. 20, 1893, *Edwall* 12381 (SP). São Bernardo, Oct. 26, 1913, *Brade* 6744 (SP). Butantan, Oct. 31, 1917, *Hoehne* 823 (SP); Sept. 28, 1920, *Gehrt* 4571 (SP). Near Una, Aug. 23, 1939, *Foster* 384 (GH). Cotia (cultivated in São Paulo), Oct. 14, 1940, *M. Kuhlmann* 44425 (SP). In mato, Paiol do Meio, *Gehrt* 44418 (SP).

PARANÁ: Near Curitiba, 1828, *Sellow* 4864 (GH). Campo, Curitiba, Dec. 1884, *Galvão in hb. Saldanha* 8839 (Mus. Nac. Rio). On trunks of *Araucaria angustifolia*, Itaiacóca near Ponta Grossa, Mar. 17, 1904, *Dusén* 4240 (Mus. Nac. Rio, S). On trees in mato, Jacarehy, alt. 885 m., Sept. 22, 1908, *Dusén* 6816 (S); on tree trunks, restinga near the sea, Sept. 21, 1914, *Dusén* 15555 (GH, S). On trunks of *Araucaria angustifolia* in mato, Itaperussú, Oct. 17, 1910, *Dusén* 7397 (BM, S, US). In mato, Pinhaes (cultivated until flowering), alt. 885 m., Dec. 17, 1910, *Dusén* 11592 (S); on tree trunks, Nov. 6, 1914, *Dusén* 15852 (GH, S, US). Epiphytic in dense masses, forest, 29 km. east of Curitiba on the road to Paranaguá, alt. 930 m., Dec. 15, 1947, *Tessmann* 2770 (US).

15. *Tillandsia* (*Allardtia*) *rhomboidea* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60: 566. Dec. 16, 1888. FIGURE 59

Stemless; leaves rosulate, stiff, 15–20 cm. long, densely cinereous-lepidote; sheaths distinct; blades narrowly triangular, involute-

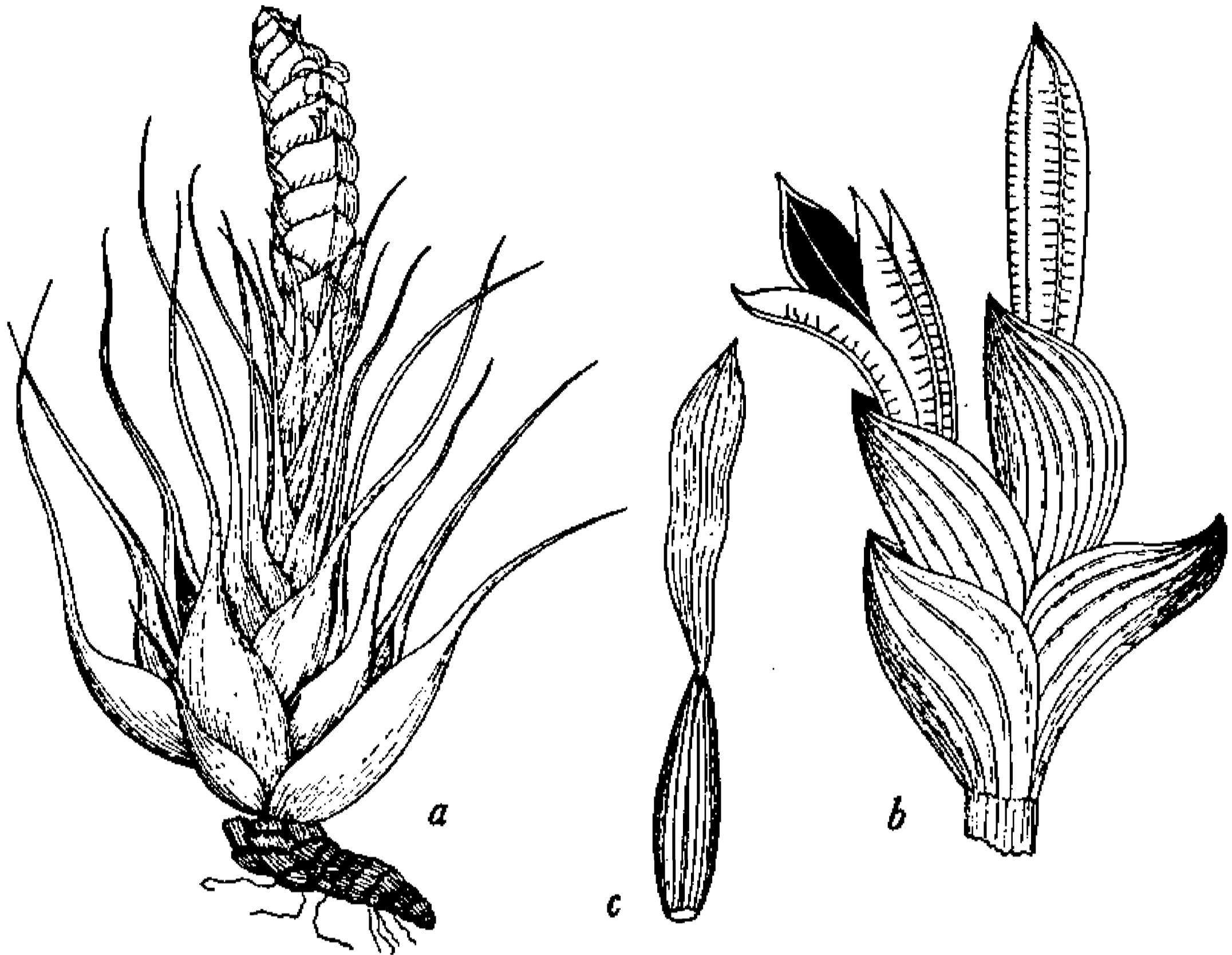


FIGURE 59.—*Tillandsia rhomboidea*: *a*, Habit, $\times 1/3$; *b*, section of fruiting inflorescence, $\times 1$; *c*, flower, $\times 1$, after André, Brom. Andr.

subulate, filiform-acuminate; scape short but distinct, erect, stout; scape-bracts imbricate, subfoliaceous; inflorescence simple, dense, 10–12 cm. long, about equaling the leaves, slightly complanate with strongly convex sides; rhachis not excavated; floral bracts broadly rhombic, acute and apiculate, twice as long as the sepals, rose-purple, sparsely lepidote, the dorsal nerve prominent; sepals lanceolate, acute, free anteriorly, completely connate posteriorly; petals three times as long as the sepals, about equaling the stamens, violet, their blades spreading to recurved, broadly obovate.

ILLUSTRATIONS: Brom. Andr. *pl.* 20.

TYPE LOCALITY: Piedra de Moler on the banks of the Río de la Vieja, Cauca Valley near Cartago, Colombia. Lectotype collected by André (No. 2745 in part).

DISTRIBUTION: Known only from the original collections.

COLOMBIA:

EL VALLE: Piedra de Moler on the banks of the Río de la Vieja, Cauca Valley near Cartago, alt. 900 m., Mar. 15, 1876, *André* 2745 in part (K, lectotype; NY). Banks of the Río Bitaco, near Cali, alt. 1,000 m., Mar.–Apr., 1876, *André* 2745 in part (K, NY).

André followed the unfortunate practice of including several collections under a single number as long as he considered them to be all of the same species. I have chosen the collection from Piedra de Moler as the type, because it appears to be the basis of his illustration.

16. *Tillandsia* (*Phytarrhiza*) *pretiosa* Mez, Repert. Sp. Nov. Fedde 16: 78. 1919.

Stemless, flowering plant 5 dm. high; leaves densely rosulate, 6 dm. long; blades linear-triangular, acuminate, 20 mm. wide, chartaceous, subglabrous; scape distinct; scape-bracts densely imbricate, the lower with short recurving blades, the upper ovate-elliptic, abruptly acute, subpungent, coriaceous; inflorescence simple, to 18-flowered, strongly complanate, 20 cm. long, 11 cm. wide; floral bracts subspreading at anthesis, scarcely imbricate or concealing the rhachis, 55 mm. long, distinctly exceeding the sepals, hardly incurved at the apex, coriaceous, even, glabrous; flowers suberect; sepals free, elliptic, acuminate, to 45 mm. long, carinate, the margin membranaceous; petals imperfectly known, about 8 cm. long when erect, blue when dry, blades large and spreading; stamens and pistil unknown.

TYPE LOCALITY: Valley of Mindo, Ecuador. Type collected by Sodiro (No. 171/39).

DISTRIBUTION: Known only from the type collection.

ECUADOR:

PICHINCHA: Valley of Mindo, Sodiro 171/39 (Berlin, type).

Mez cites the locality as "Mindá" but probably refers to the Río Mindo northwest of Quito where Sodiro did much of his collecting.

17. *Tillandsia* (*Allardtia*) *lampropoda* L. B. Smith in Yuncker, Field Mus. Publ. Bot. 17: 320, pl. 9. 1938. FIGURE 60

Stemless, to 50 cm. high; leaves many in a slenderly cyathiform rosette, 35–40 cm. long, sheaths oblong-elliptic, 1 dm. long, densely and obscurely punctulate-lepidote, bright purple; blades very narrowly triangular, caudate-acuminate, 15–30 mm. wide, densely appressed-cinereous-lepidote; scape erect, 6 mm. thick, glabrous; scape-bracts imbricate, broadly ovate, apiculate or the lowest caudate-laminate, very obscurely punctulate, even, lustrous, red; inflorescence simple, elliptic, acute, strongly complanate, 15–18 cm. long, 45–70 mm. wide; floral bracts densely imbricate, broadly ovate, acute, to 55 mm. long, sharply carinate, coriaceous, even, lustrous, yellow, green or red, cinereous-lepidote toward the apex; flowers subsessile; sepals free, narrowly lanceolate, acute, 32 mm. long, carinate, coriaceous, nerved, glabrous; petals linear, 5–6 cm. long, equaling the stamens, yellow; style exerted.

TYPE LOCALITY: On tree near El Achote, above plains of Siguatepeque, Comayagua, Honduras. Type collected by Yuncker, Dawson, and Youse (No. 5895).

DISTRIBUTION: Guatemala, Honduras.

GUATEMALA:

HUEHUETENANGO: Epiphytic, cloud forest, between Xoxlac and Nucapoxlac, Sierra de los Cuchumatanes, alt. 1,650–2,500 m., July 17, 1942, *Steyermark* 48964 (F).

ALTA VERAPAZ: On tree, near Tactic, alt. ca. 1,500 m., April 10, 1941, *Standley* 92019 (F); alt. ca. 1,450 m., April 14, 1941, *Standley* 92344 (F); alt. 1,300 m., Feb. 20, 1942, *Steyermark* 44004 (F, GH, US). San Cristóbal, Mar. 23, 1946, *Carlson* (F).

BAJA VERAPAZ: On tree in forest of pine and oak, dry rocky hills north of Santa Rosa, Mar. 30, 1939, *Standley* 69778 (F).

QUEZALTENANGO: On tree in damp dense mixed forest on white sand slopes, above Mujuliá, between San Martín Chile Verde and Colomba, alt. ca. 1,800 m., Feb. 1, 1941, *Standley* 85532 (F).

ZACAPA: Between Cerro de Monos and upper slopes of Monte Virgen, alt. 2,000–2,600 m., Jan. 17, 1942, *Steyermark* 42890 (F). On tree along river, upper reaches of Río Sitio Nuevo, alt. 1,500–1,800 m., Jan. 25, 1942, *Steyermark* 43210 (F, GH).

SUCHITEPÉQUEZ: Epiphytic, upper forested slopes of barranco by Loma Grande, above Finca El Naranjo, on Volcán Santa Clara, alt. 1,950–2,100 m., June 2, 1942, *Steyermark* 46839 (F).

HONDURAS:

COMAYAGUA: On tree, near El Achote, above the plains of Siguatepeque, alt. 1,350 m., July 15, 1936, *Yuncker, Dawson, & Youse* 5895 (GH, type).

18. *Tillandsia* (Phytarrhiza) *anceps* Lodd. Bot. Cab. 8: pl. 771. 1823.

FIGURE 60

Platystachys anceps Beer, Bromel. 80. 1857.

Vriesea anceps Lem. Ill. Hort. 6: misc. 15. 1859.

Tillandsia xiphostachys Griseb. Nachr. Ges. Wiss. Goett. for 1864: 14. 1865, in part.

Phytarrhiza anceps E. Morr. Belg. Hort. 29: 368, pl. 20, 21. 1879.

Vriesea schlehtendahlia Wittm. Bot. Jahrb. Engler 11: 69. 1889. Excl. syn.

Vriesea schlehtendahlia var. *alba* Wittm. Bot. Jahrb. Engler 11: 69. 1889.

Tillandsia lineatifolia Mez in DC. Monogr. Phan. 9: 686. 1896.

Tillandsia compressa sensu Kenoyer & Standl. Field Mus. Publ. Bot. 4: 147. 1929. Not Bertero.

Stemless; leaves numerous, densely rosulate, 15–40 cm. long, equaling or exceeding the inflorescence, very densely and minutely pale-appressed-lepidote throughout, green; sheaths triangular-ovate, longitudinally red-striate; blades recurving, narrowly triangular, acuminate, 7–12 mm. wide at the base; scape erect, stout, very short and largely hidden by the leaves; scape-bracts erect, densely imbricate, ovate, acute or the lowest with a stiff erect linear blade, much smaller than the floral bracts, coriaceous, even, glabrous; inflorescence simple, elliptic, strongly complanate, 10–15 cm. long, 55 mm. wide, densely 10–20-flowered, glabrous; floral bracts suberect, densely imbricate, triangular-acute, up to 4 cm. long, much exceeding the sepals, strongly carinate, coriaceous, even, somewhat shiny, green or pale rose with greenish margins; flowers short-pedicellate; sepals narrowly lanceo-

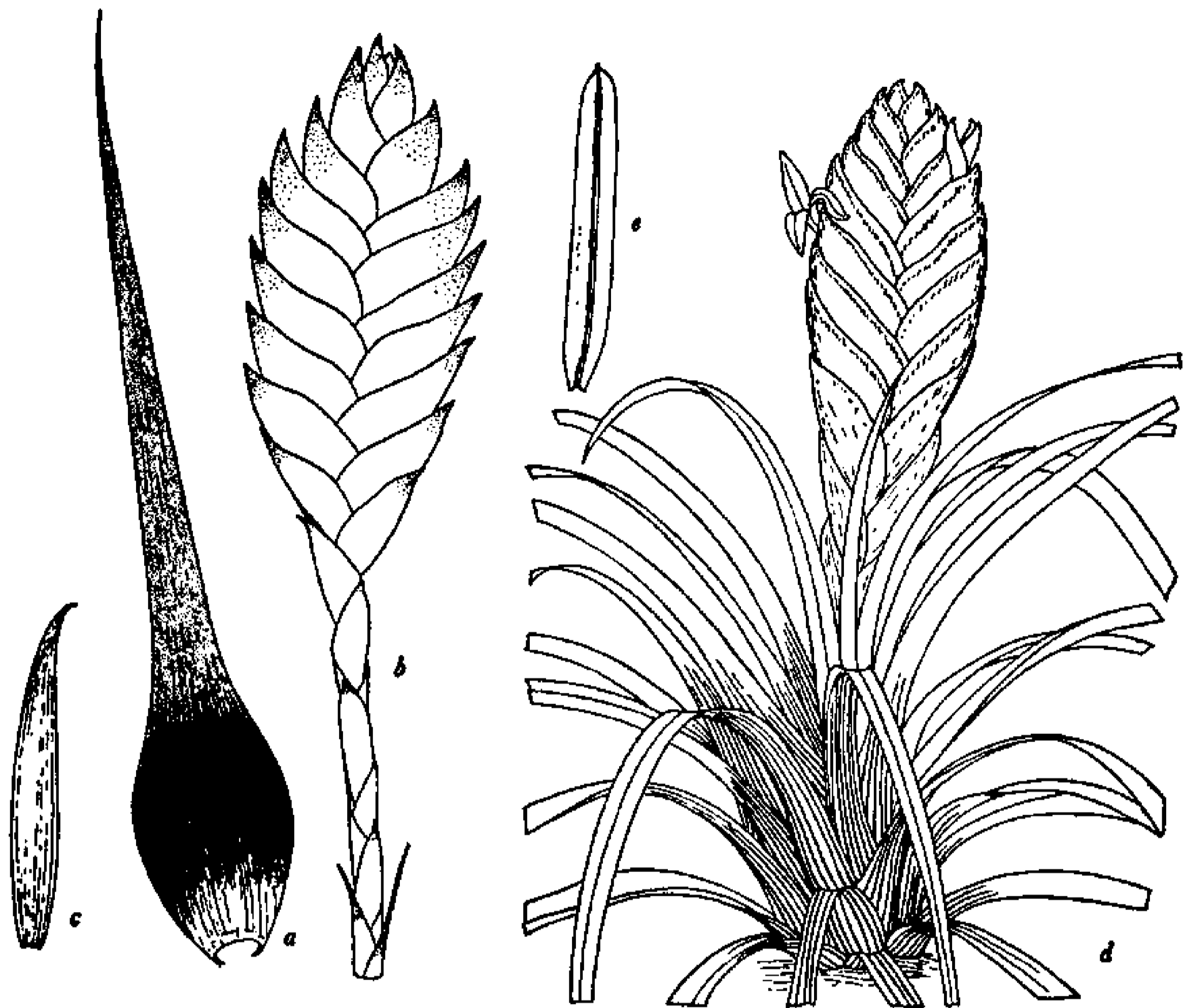


FIGURE 60.—*Tillandsia lampropoda*: *a*, Leaf, $\times 1/3$; *b*, scape and inflorescence, $\times 1/3$; *c*, sepal, lateral view, $\times 1$. *Tillandsia anceps*: *d*, Habit, $\times 1/3$, after E. Morren, Belg. Hort.; *e*, sepal, $\times 1$.

late, acute, 3 cm. long, coriaceous, even, equally subfree, carinate; petals more than twice as long as the sepals, the claw linear, white, the blade spreading, lance-elliptic, acute, blue or rarely white; stamens deeply included, exceeding the style; capsule slenderly cylindric, shorter than the sepals.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. 31: fig. 107; Field Mus. Publ. Bot. 10: pl. 13.

TYPE LOCALITY: "Trinidad." Described from cultivation.

DISTRIBUTION: Central America, Trinidad, northern South America.

GUATEMALA:

ALTA VERAPAZ: Along Río Ixvolai between Río Apia and Río Soctelá, 8–10 miles northwest of Cubilgüitz, alt. 200–210 m., Mar. 14, 1942, *Steyermark* 45087 (F).

IZABAL: Jungle epiphyte, Río Chacón, alt. 30 m., Mar. 1921, *Johnson* 1295 (US). Epiphytic, damp forested slopes and barrancos, Cerro San Gil, alt. 300–900 m., Dec. 25, 1941, *Steyermark* 41894 (F).

BRITISH HONDURAS:

STANN CREEK DISTRICT: On tree in high ridge on hilltop, Middlesex, Oct. 20, 1939, *Gentle* 3040 (GH). Stann Creek Valley, Antelope Ridge, Feb. 1940, *Gentle* 3191 (GH).

HONDURAS:

ATLÁNTIDA: On tree in wet forest, Lancetilla Valley near Tela, alt. 20-600 m., Dec. 1927-Mar. 1928, *Standley* 53194, 56850 (F).

COSTA RICA:

GUANACASTE: On tree in wet forest, Los Ayotes, near Tilarán, alt. 600-700 m., Jan. 21, 1926, *Standley & Valerio* 45617 (US). On tree, La Tejona, north of Tilarán, alt. 600-700 m., Jan. 25, 1926, *Standley & Valerio* 45987 (US). On tree in moist forest, Naranjos Agrios, alt. 600-700 m., Jan. 29, 1926, *Standley & Valerio* 46400 (US).

PUNTARENAS: Playa Blanca, Golfo Dulce, Feb. 25, 1933, *Valerio* 561 (F).

LIMÓN: La Salvadora, Reventazón River, near sea-level, April 7, 1928, *Lankester* 1185 (F).

CARTAGO: Forest of San Pedro, near San Ramón, alt. 1,300-1,400 m., April 1913, *Tonduz* 17895 (US).

PANAMA:

COCLÉ: Hills north of El Valle de Antón, trail to La Mesa, alt. ca. 1,000 m., Sept. 2, 1941, *Allen* 2733 (US). Region north of El Valle, alt. 1,000 m., *Allen* 3690 (MO).

CANAL ZONE: Between Frijoles and Monte Lirio, alt. 30 m., Oct. 18, 1922, *Killip* 12144 (US). Barro Colorado Island, 1927, *Kenoyer* 215 (US); June 26, 1931, *L. H. Bailey* 370 (Bailey Hort.); Oct. 26, 1931, *Shattuck* 560 (F); 1931, *Aviles* 13 (F); 1933, *Aviles* 7 (F). Westerly arm of Quebrada Salamanca, alt. 70 m., Dec. 16, 1934, *Dodge, Steyermark, & Allen* 17028 (GH, MO). On branches of tree, near Río Medio, Feb. 11, 1937, *Miller* 1754 (US).

TRINIDAD: On tree, Tamana Forests, Feb. 16, 1915, *Broadway* 7809 (TRIN). Mount Tamana, Mar. 27, 1925, *Broadway* (F).

BRITISH GUIANA:

NORTHWEST DISTRICT: Epiphytic, Mount Everard, Feb. 12, 1922, *Cruz* 1301 in part (GH).

DEMERARA: Epiphytic on *Morabukea*, Moraballi Creek, Essequibo River, ca. latitude 6°11' N., Sept. 20, 1929, *Sandwith* 310 (K).

VENEZUELA:

ANZOÁTEGUI: On tree, by state of Sucre boundary, vicinity of confluence of Río León with Río Zumbador, northeast of Bergantín, alt. 400-500 m., Feb. 26, 1945, *Steyermark* 61206 (F, GH).

ARAGUA (?): Between Petaquire and the sea, alt. 1,150 m., 1857, *Fendler* 2447 (Goettingen, type of *Tillandsia lineatifolia* Mez).

COLOMBIA:

NORTE DE SANTANDER: Epiphytic, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1690 (GH).

EL VALLE: On trees in dense forest, Las Juntas del Dagua, alt. 300-600 m., *Lehmann* K-356 (K). Epiphytic, mangrove swamp, Buenaventura Bay, April 13, 1939, *Killip* 34952 (US).

BRAZIL:

PARÁ: Epiphyte, south forest of the Instituto Agronómico do Norte, Belém, Nov. 16, 1942, *Archer* 7832 (US).

Baker cites this species in the *Journal of Botany* and in his *Handbook* but in both instances his descriptions are based on *Tillandsia fasciculata*. Thanks to Mr. N. Y. Sandwith of Kew, I have a photograph of the type of *T. lineatifolia* Mez, which shows beyond doubt that it is a synonym of the earlier *T. anceps*.

19. *Tillandsia* (Phytarrhiza) *cyanea* Linden ex K. Koch, *Wochenschrift* 10: 140. 1867. FIGURE 61
Tillandsia lindeni E. Morr. Belg. Hort. 19: 321, *pl.* 18. ca. Nov. 1869.
Vriesea lindeni Lem. Ill. Hort. 16: *pl.* 610. 1869.
Tillandsia morreniana Regel, *Gartenflora*, 19: 41. 1870.
Tillandsia coerulea Linden ex K. Koch, *Wochenschrift* 13: 197. 1870. Nomen, in synonymy.
Wallisia lindeni E. Morr. Belg. Hort. 20: 102. 1870. Nomen provisorium.
Tillandsia lindeni vera Dombroin, *Floral Mag.* 11: *pl.* 44. 1872.
Tillandsia lindeni var. *genuina* E. Morr. Gard. Chron. II. 12: 460. 1879.
Phytarrhiza lindeni var. *genuina* E. Morr. Belg. Hort. 29: 297. 1879.
? *Tillandsia lindeni* var. *violacea* Hort. ex André, *Rev. Hort.* 58: 61. 1886.
Tillandsia lindeni sensu Mez in DC. *Monogr. Phan.* 9: 845. 1896. In part, as to some synonymy, not as to description. Not Regel.
Tillandsia lindeni superba rosea Dauthenay, *Rev. Hort.* 70: 539. 1898.
Tillandsia lindeni vera superba Duval, *Gartenwelt* 5: 164, *fig.* 1901.

Stemless, scarcely more than 25 cm. high; leaves many, suberect, then recurving, to 35 cm. long, more or less red-striate toward base, finely appressed-lepidote; sheaths elliptic, distinct, 6 cm. long; blades linear-triangular, acuminate, 10–15 mm. wide; scape erect or inclined, very short and almost completely hidden by the leaves; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic, acute; inflorescence simple with several sterile bracts at the base, elliptic, obtuse or broadly acute, strongly complanate, to 16 cm. long and 7 cm. wide, very dense, to 20-flowered; floral bracts elliptic, acute, sharply carinate, exceeding the sepals, coriaceous, even, rose or red, drying to stramineous, obscurely pale-lepidote; sepals free, elliptic, obtuse or broadly acute, 35 mm. long; petal-blades spreading, broadly subrhombic, apiculate, deep violet, 20–25 mm. long; stamens deeply included, exceeding the style.

ILLUSTRATIONS: *Rev. Hort.* 50: 390; *The Garden* 17: *pl.* 215; *Gartenwelt* 5: 164; *Floral Mag.* 19: *pl.* 385.

TYPE LOCALITY: "Huancabamba, Peru," described from cultivation. Actually from Zozoranga, Ecuador. Type collected by Wallis.

DISTRIBUTION: Southern Ecuador.

ECUADOR:

CHIMBORAZO: Vicinity of Huigra, Sept. 8, 1918, *Rose* 22617 (NY, US).

AZUAY: Epiphytic, rich rainforest jungle, steep slopes along Río Patul between Hacienda Yubay and Hacienda San José de Caimotán, in region of Sanagüin, alt. 850 m., May 28, 1943, *Steyermark* 52740 (F, GH).

LOJA: Zozoranga, ca. 1866, *Wallis* (no herbarium type, but cf. illustrations in bibliography above).

EL ORO: Between Portovelo (gold mine near Zaruma) and El Tambo, alt. 600–1,000 m., Sept. 2, 1923, *Hitchcock* 21304 (GH, NY, US). Epiphytic, along trail between Portovelo and Río Cabra, passing Minas Nuevas, Huertas, and arriving at Cachicarán, alt. 640–1,645 m., Aug. 23, 1943, *Steyermark* 54095 (F, GH).

FROM CULTIVATION: April 1943, *Missouri Botanical Garden* 158–29–14 (GH). June, 1943, *Barry* (GH).



FIGURE 61.—*Tillandsia cyanea*: *a*, Habit, $\times 1/10$; *b*, inflorescence, $\times 1/2$, after E. Morren, Belg. Hort.; *c*, sepal, $\times 1$. *Tillandsia lindeni* (earliest cultivated form): *d*, Habit, $\times 1/2$; *e*, petal, stamens, and pistil, $\times 1/2$, after Regel, Gartenflora.

After a lapse of over 80 years it is still impossible to see any difference between the cultivated material cited above and the specimens that have come directly from their natural habitat.

Dr. Bernice G. Schubert has verified the reference to *Tillandsia cyanea* in Linden's catalog for 1867 in the library at Kew and it is merely a nomen. However, Koch's thumbnail sketch of the species in *Wochenschrift* of that same year is sufficient to validate the species and show that it has nothing to do with the paniculate *T. cyanea* of E. Morren published in 1879. In describing Linden's exhibit at the Paris horticultural meeting, Koch says: "Als *Tillandsia cyanea*

fand ich eine Pflanze, welche einen etwas gestielten, aber dicht gedrängten und eiförmigen Blütenstand von rother (nicht blauer) Farbe besass, vor;" This in itself is sufficient to effect publication, but elsewhere he refers to "eine Tillandsia mit grossen blauen Blüten," which is undoubtedly the same plant, since the species has red bracts and blue petals.

19a. *Tillandsia cyanea* Linden ex K. Koch var. *tricolor* (André) L. B. Smith, comb. nov.

Tillandsia lindeni E. Morr. var. *tricolor* André, Ill. Hort. 24: 190. 1877.

Spikes broadly oblong, many-flowered; petal-blades blue with a white eye at the base.

TYPE LOCALITY: Along the Río del Cristal between Pisagua and Sabanetas, Los Rios, Ecuador. Type collected by André (No. 4040).

DISTRIBUTION: Southern Ecuador.

ECUADOR:

GUAYAS: Chimbo River Valley, alt. 1,000 m., June 1934, *Rimbach* 199 (F).

Los Ríos: Along the Río del Cristal between Pisagua and Sabanetas, latitude 1°40' S., alt. 200 m., July 11, 1876, *André* 4040 (K, type).

The other so-called varieties of the short-scaped species described under *T. lindeni* Morren are simply more vigorous cultivated forms and hardly worth designation.

20. *Tillandsia* (Phytarrhiza) *lindeni* Regel, Ind. Sem. Hort. Petrop. for 1868: 92. Mar. 1869; Ann. Sci. Nat. V. 10: 382. Ca. Aug. 1869.

FIGURES 61 and 62

Tillandsia lindeni Regel, Gartenflora 18: 193, pl. 619. 1869.

Tillandsia lindeni E. Morr. var. *regeliana* E. Morr. Belg. Hort. 20: 225, pl. 12. 1870.

Tillandsia lindeni var. *major* Dombrain, Floral Mag. 10: pl. 529. 1871.

† *Vriesia violacea* Hort. ex Houll. Rev. Hort. 44: 230. 1872. Nomen, in synonymy.

Tillandsia lindeni var. *rutilans* Linden ex Houll. Rev. Hort. 44: 230. 1872. Nomen, in synonymy.

Tillandsia lindeni E. Morr. var. *intermedia* E. Morr. ex Carr. Rev. Hort. 50: 390. 1878.

Phytarrhiza lindeni E. Morr. var. *intermedia* E. Morr. Belg. Hort. 29: 298. 1879.

Phytarrhiza lindeni E. Morr. var. *regeliana* E. Morr. Belg. Hort. 29: 298. 1879.

† *Tillandsia lindeni* var. *violacea* Hort. ex André, Rev. Hort. 58: 61. 1896.

Tillandsia lindeni vera major Duval, Gartenwelt 5: 164. 1901.

Stemless, to 8 dm. high; leaves many, 4 dm. long, arching-decurved, more or less striped with red-purple toward the base; sheaths small, elliptic; blades linear-triangular, acuminate, 12–18 mm. wide, covered with minute pale appressed scales beneath, subglabrous above; scape erect, slender, elongate; scape-bracts imbricate, the lower subfoliaceous, the upper elliptic, acute; inflorescence simple, lanceolate or lance-oblong, acute, strongly complanate, dense, up to 20-flowered, up to 20 cm. long and 5 cm. wide, glabrous; floral bracts imbricate,

elliptic, acute, 40–45 mm. long, slightly exceeding the sepals, sharply carinate, subcoriaceous, nerved, green to rose in life; sepals elliptic, obtuse, usually involute, 35 mm. long, ecarinate, coriaceous, nearly even; petal-blades spreading, orbicular, to 4 cm. long, deep blue with a white eye at the base; stamens deeply included, exceeding the pistil.

ILLUSTRATIONS: B. S. Williams, *Choice Stove & Greenh. Pl.* 2: 307; ed. 2. 1: 76; *Rev. Hort.* 44: 230; *Garden* 10: *pl.* 46; *Deutsche Gartenkunst* 1880: 434; *Nat. Pflanzenfam.* 2: Abt. 4, 57, *fig.* 28A; ed. 2. 15a: *fig.* 45A; *Bot. Mag. Curtis* 96: *pl.* 5850; *Journ. Hort.* 43: 358; *Bois, Dict. Hort.* *fig.* 898; *Gard. Chron.* II. 12: *fig.* 72. 1879; III. 66: *fig.* 196.

TYPE LOCALITY: "Zazoranga, Ecuador," described from cultivation. Actually from Huancabamba, Peru. Type collected by Wallis.

DISTRIBUTION: Northwestern Peru.

PERU:

PIURA: Huancabamba, ca. 1865, *Wallis* (no herbarium type, but cf. illustrations in bibliography above). Prov. Huancabamba: Epiphytic, Chorro Blanco, 5 km. north of Canchaque, alt. 1,250 m., April 5, 1939, *Stork* 11406 (GH).

The name, "*Tillandsia lindeni*," sets a new high for confusion in the Bromeliaceae. As used here it applies to the "long-scaped" species first noted by Regel, and not to the "short-scaped" species that E. Morren described as new under the same name. Regel, after publishing his species twice as "lindeni," for no explained reason changed to "lindeniana" for his third and best-known description, and a year later proposed "morreniana" as a new name for Morren's species to avoid duplication of the "lindeni" he now disowned. Morren, not to be outdone in weird reasoning, proceeded to make Regel's earlier species a variety *regeliana* of his, the later, "lindeni."

Regel and Morren argued back and forth in print over the names and status of their two finds and were later further confused by André. Meanwhile, the horticultural writers, struck by the great beauty of the plants, published a profusion of notes and illustrations without stopping to verify names and identities. In several instances they managed to illustrate "lindeni" of Regel while labeling it "lindeni" of Morren.

Regel contented himself in arguing the priority of his name and the specific distinction of the two entities involved. Morren considered them varieties of the same species and went on to add further varieties, still under the wrong "lindeni," with the paradoxical result that three of them must now be transferred from "lindeni" of Morren to "lindeni" of Regel, since the two species were founded independently, and on different types.

Again we meet confusion in the battle of *Tillandsia lindeni*. Both species were collected by Wallis and, as reported by Regel, one came from Zozoranga in Ecuador and the other from Huancabamba in Peru. Morren claimed that they were but a single collection, but

later collections would refute this and also indicate that Regel had reversed species and localities. Actually, all collections since the types indicate that the species with the long scape is Peruvian and that with the short is Ecuadorian.

The earliest specimen of *Tillandsia lindeni* to be illustrated (see fig. 61, *d*) was few-flowered and rather resembled *T. umbellata*, but later more vigorous plants had larger inflorescences (see fig. 62, *a*) that contrast sharply with that species.



FIGURE 62.—*Tillandsia lindeni* (later luxuriant cultivated form): *a*, Inflorescence, $\times 1/3$ after Dombrain, Floral Mag. *Tillandsia umbellata*: *b*, Habit, $\times 1/3$, after André, Rev. Hort.

The three varieties distinguished from the typical below are all of horticultural origin and one is a hybrid:

Scapes solitary, terminal.

Spike lanceolate, acute..... *Tillandsia lindeni*

Spike elliptic, obtuse..... a. Var. \times *duvali*

Scapes several, terminal and axillary.

Flowers single..... b. Var. *luxurians*

Flowers more or less doubled..... c. Var. *koutsinskyana*

20a. \times *Tillandsia lindeni* Regel var. *duvali* (Duval ex André) L. B. Smith, comb. nov.

Tillandsia lindeni [E. Morr.] var. \times *duvali* Duval ex André, Rev. Hort. 71: 516. 1899.

\times *Tillandsia duvali* Duval in Gartenwelt 5: 164, fig. 1901. Scape solitary, terminal; spike elliptic, obtuse.

DISTRIBUTION: Known only from cultivation.

No material seen. The cross is: ♂ *T. cyanea* × ♀ *T. lindeni* and shows the broad blunt spike of *T. cyanea* and the long scape of *T. lindeni*. The original publication of Var. *duvali* does not cite Morren after the species name, "lindeni," but it is obvious that it was so understood from the mention of Var. *regeliana* in the discussion.

20b. *Tillandsia lindeni* Regel var. *luxurians* (E. Morr.) L. B. Smith, comb. nov.
Tillandsia lindeni E. Morr. var. *luxurians* E. Morr. Belg. Hort. 21: 289, pl. 20, 21. 1871.

Phytarrhiza lindeni var. *luxurians* E. Morr. Belg. Hort. 29: 299. 1879.

Tillandsia lindeni var. *regeliana* sensu André Ill. Hort. 27: pl. 370. 1880. Not E. Morr.

Tillandsia lindeni splendida Carr. Rev. Hort. 54: 12, pl. 1882.

Tillandsia lindeni sensu Hasack, Möllers Deutsche Gärtn.-Zeit. 15: 93, fig. 1900.

Scapes several, terminal and axillary; spikes lanceolate; flowers single.

ILLUSTRATIONS: Semaine Hort. 4: pl. 46. 1900.

DISTRIBUTION: Known only from cultivation. No material seen.

20c. *Tillandsia lindeni* Regel var. *koutsinskyana* (E. Morr.) L. B. Smith, comb. nov.

Phytarrhiza lindeni var. *koutsinskyana* E. Morr. Belg. Hort. 30: 80. 1880.

Scapes several, terminal and axillary; flowers more or less doubled, up to 8 cm. in diameter.

DISTRIBUTION: Known only from cultivation. No material seen.

21. *Tillandsia* (Phytarrhiza) *umbellata* André, Rev. Hort. 58: 60, pl. 1886.

FIGURE 62

Stemless; leaves spreading-recurving, 25–35 cm. long, exceeding the inflorescence, red-striped beneath toward the base; sheaths small, narrowly elliptic; blades linear-triangular, acuminate, 15 mm. wide at the base, appearing glabrous; scape erect or suberect, slender; scape-bracts closely imbricate, elliptic, acute; inflorescence simple, 4–6-flowered, lanceolate, acute, strongly complanate, 6–7 cm. long exclusive of the petals; floral bracts imbricate, about 4–5 times as long as the internodes, elliptic, acute, carinate, 4 cm. long, equaling or exceeding the sepals, striate, green; flowers all opening at about the same time; sepals free, obtuse, ecarinate; petal-claw linear, white, equaling the sepals, petal-blade obovate, broadly obtuse, 40 mm. long, 25 mm. wide, deep blue with a white eye at the base; stamens deeply included, exceeding the pistil.

TYPE LOCALITY: Between Cisne and Ambocas, Ecuador. Type collected by Poortman (No. 469).

DISTRIBUTION: Known only from the type collection.

ECUADOR:

EL ORO or LOJA: Between Cisne and Ambocas, May 1882, Poortman (469) K 317 (K).

The specimen cited above, if not the type, is at least its lineal descendant. The label bears the number "K 317" while André cites "Poortman 469," which indicates that more than one plant may be involved.

22. *Tillandsia* (*Tillandsia*) *kegeliana* Mez in DC. Monogr. Phan. 9: 725. 1896.

FIGURE 63

Stemless; leaves many in a dense rosette, 12–17 cm. long; sheaths broadly ovate, over 3 cm. long, membranaceous, castaneous-lepidote; blades often more or less secund, linear-triangular, involute-subulate,

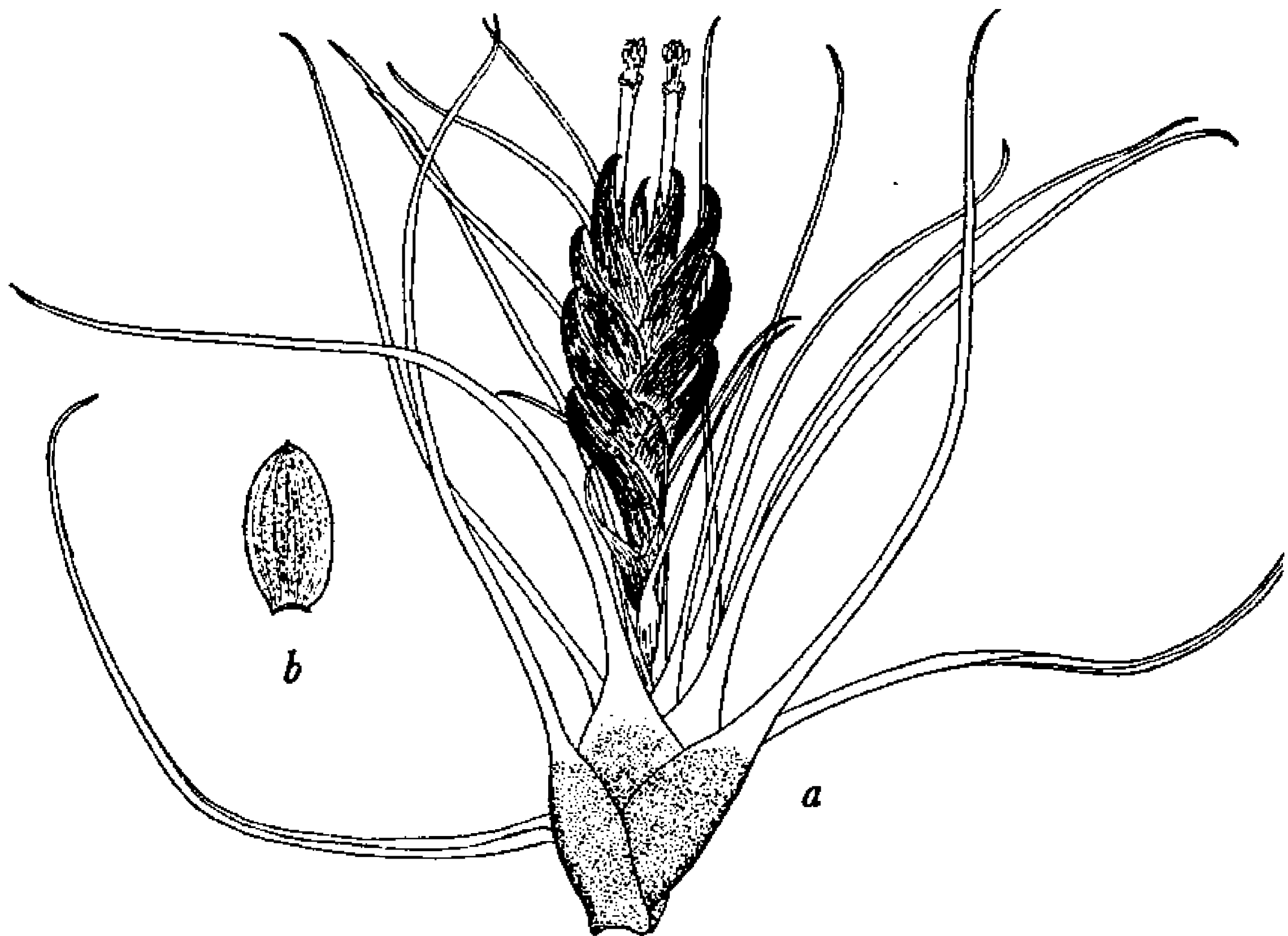


FIGURE 63.—*Tillandsia kegeliana*: *a*, Habit, $\times 1/2$; *b*, sepal, $\times 1$.

acuminate, 5 mm. wide at the base, rigid, densely pale-lepidote; scape slender, ascending, very short, glabrous; scape-bracts erect, densely imbricate, lance-ovate, long-caudate, appressed-lepidote; inflorescence simple, exceeded by the leaves, densely 6–8-flowered, elliptic, strongly complanate, 40–55 mm. long, 30–35 mm. wide; rhachis undulate, angled, glabrous; floral bracts suberect, densely imbricate, acuminate from a broadly elliptic base, carinate, incurved, 3 cm. long, 16 mm. wide, fleshy, bright red when living, thin, minutely rugulose and blackish when dry, obscurely pale-lepidote to glabrous; flowers erect or suberect; pedicels short and thick; sepals elliptic, obtuse, 2 cm. long, 7.5 mm. wide, coriaceous when dry, probably fleshy when living, densely punctulate-lepidote, slightly nerved, free; petals over 4 cm. long, dark purple; stamens exserted; capsule subprismatic, over 5 cm. long.

ILLUSTRATIONS: *Ann. Missouri Bot. Gard.* **31**: fig. 120.

TYPE LOCALITY: Near Paramaribo, Suriname. Type collected by Kegel.

DISTRIBUTION: Panama, Suriname, Colombia.

PANAMA:

DARIÉN: Forests around Yaviza, southern Darién, April 22, 23, 1914, *H. Pittier* 6583 (US).

SURINAME: on branches of *Crescentia* and *Mangifera*, near Paramaribo, *Kegel* 802, 881; *Splitgerber* 644 (! Mez).

COLOMBIA:

SANTANDER: Epiphytic, Camp Puente, near Barranca Bermeja, Magdalena Valley, between Sogamoso and Colorado Rivers, alt. 100–500 m., Mar. 5, 1935, *Haught* 1587 (GH, US). On trees along ridges, Camp Carare IV, near Puerto Berrio, between Carare and Magdalena Rivers, alt. 100–700 m., May 2, 1935, *Haught* 1689 (US).

The three collections from Suriname were all cited in the original description without selection of the type. The other material has been determined on the basis of Mez's description.

23. *Tillandsia* (? *Tillandsia*) *lepidosepala* L. B. Smith, *Proc. Amer. Acad.* **70**: 155, pl. 2, fig. 2, 3. 1935. FIGURE 64

Stemless or very short-caulescent, often aggregated in dense masses; leaves rosulate, up to 15 cm. long, covered with slightly spreading

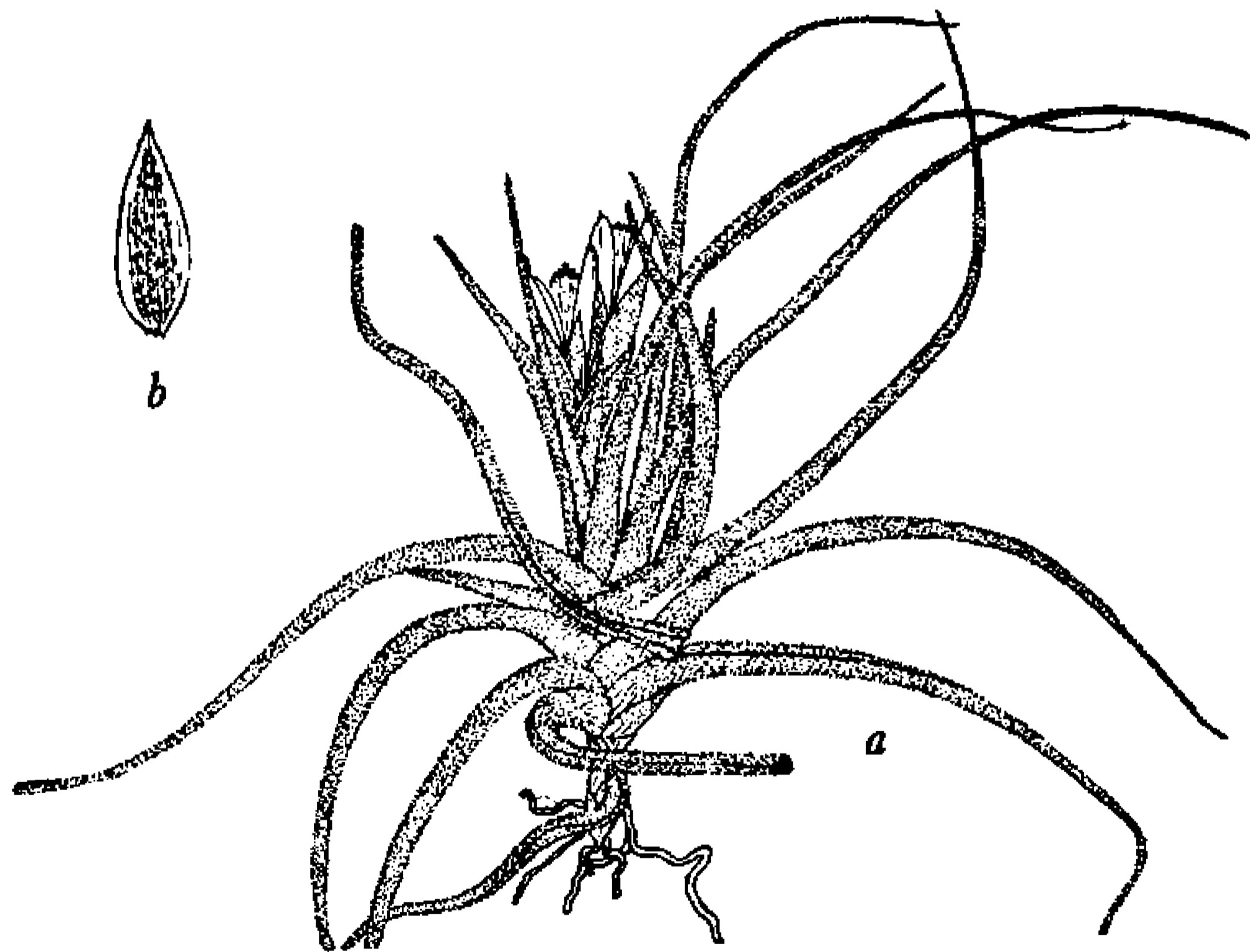


FIGURE 64.—*Tillandsia lepidosepala*: a, Habit, $\times 1/2$; b, sepal, $\times 1$.

cinereous scales; sheaths broadly ovate or suborbicular, not at all inflated, 10–15 mm. long; blades erect or spreading, linear-triangular, acuminate, 7 mm. wide at the base, involute; scape short, almost hidden by the leaves; scape-bracts erect, densely imbricate, foliaceous, about equaling the inflorescence; inflorescence simple or rarely with

a small second spike and primary bract like the upper scape-bracts, exceeded by the leaves; spikes 3–5 cm. long, 2–5-flowered, dense, strongly complanate; floral bracts lanceolate, acute, 20–35 mm. long, equaling or exceeding the sepals, three to four times as long as the internodes, submembranaceous, not at all carinate, densely cinereous-lepidote; flowers sessile; sepals lanceolate, acuminate, up to 20 mm. long, strongly nerved, densely lepidote, free, the lateral ones carinate; petals blue (! Foster); capsule cylindrical, short-beaked, about equaling the floral bracts.

TYPE LOCALITY: Near Lake Cuitzco, Michoacán, Mexico. Type collected by Pringle (No. 5323).

DISTRIBUTION: Central Mexico.

MEXICO:

HIDALGO: Near Tula, July 3, 4, 1905, *Rose, Painter, & Rose* 8283 (US). On rocks, steep rocky volcanic outcrops at head of descent into Barranca de Metztlán, between Zoquital and Los Venados, alt. ca. 2,000 m., July 31, 1948, *Moore & Wood* 4221 (US).

PUEBLA: Teocalli de Cholula, near Puebla, alt. 2,224 m., Nov. 7, 1907, *Arsène* 1846 (GH, NY, US). Malinche, near Puebla, 1910, *Nicolas in hb.* *Arsène* 5742 (US).

MÉXICO OR FEDERAL DISTRICT: Valley of Mexico, July 4, 1865, *Bourgeau* 97 (GH).

MÉXICO OR MICHOACÁN: Mountains between México and Morelia, May 29, 1849, *Gregg* 1247 (MO, very old, identity uncertain).

MICHOACÁN: On trees near Lake Cuitzco, Aug. 9, 1892, *Pringle* 5323 (GH, type). Indefinite, 1938, *Foster* XV (GH).

24. *Tillandsia* (*Allardtia*) *petraea* L. B. Smith, sp. nov.

FIGURE 65

Caule ignoto; laminis foliorum quam vaginis castaneis subduplo longioribus, anguste triangularibus, dense cinereo-lepidotis; inflorescentia simplicissima; rhachi excavata; bracteis florigeris distichis, ecarinatis, ad 6 cm. longis, sepala multo superantibus; sepalis liberis, ellipticis, glabris; petalis stamina subaequantibus.

Known only from fragments but probably stemless; leaves erect, densely appressed-lepidote; sheaths elliptic, ample, 7–10 cm. long, dark castaneous; blades narrowly triangular, acuminate, one and a half to two times as long as the sheaths, 3–4 cm. wide at the base; scape erect, 6 mm. thick; scape-bracts erect, densely imbricate, broadly elliptic, apiculate, thin, nerved, appressed-cinereous-lepidote; inflorescence simple, linear, acuminate, complanate, 27 cm. long, 3 cm. wide; rhachis excavated; floral bracts densely imbricate, broadly elliptic, acute, ecarinate, 6 cm. long, thin-coriaceous, rose (! Espinosa), stramineous when dry except for a narrow dark red margin, the lowest lepidote toward the apex; pedicels 5 mm. long; sepals free, elliptic, acute, 3 cm. long, obtusely carinate, glabrous; petals 6 cm. long, about equaling the stamens, green.

Type in the U. S. National Herbarium, No. 1950599, collected on rocks, Chepel, Llanos Payama, northeast of Zaruma, Province of El Oro, Ecuador, altitude 2,950 meters, August 30, 1947, by R. Espinosa (No. E 2002).

DISTRIBUTION: Known only from the type.

ECUADOR:

EL ORO: On rocks, Chepel, Llanos Payama, northeast of Zaruma, alt. 2,950 m., Aug. 30, 1947, *R. Espinosa* E 2002 (US, type).

Because the type lacks a base, *Tillandsia petraea* cannot be classified as caulescent or acaulescent. However, it possesses such ample leaf-sheaths that I feel the probabilities are with the acaulescent character and consequently am including the species here.

If, on the contrary, it proves to be a caulescent plant, then it belongs next to *Tillandsia cauligera* Mez in my treatment in the Proceedings of the American Academy of Arts and Sciences 70: 162. 1935. It differs from that species in its castaneous leaf-sheaths, large floral bracts, and free sepals.

25. *Tillandsia* (Anoplophytum) *espinosae* L. B. Smith, sp. nov. FIGURE 65

Acaulis; foliis multis, utrinque lepidibus minutis cinereis vestitis, vaginis haud inflatis, inconspicuis, laminis lineari-triangularibus; scapo erecto; scapi vaginis imbricatis; inflorescentia simplicissima, complanata; rhachi excavata; bracteis florigeris distichis, paulo imbricatis, sepala multo superantibus, ecarinatis, tenuibus; sepalis symmetricis, liberis, sparse obscureque lepidotis; filamentis plicatis.

Stemless, flowering plant 15–16 cm. high; leaves many, densely rosulate, divergent or spreading in all directions, very densely lepidote throughout with minute cinereous subappressed scales; sheaths broadly ovate, scarcely distinct from the blades; blades rigid, nearly straight, linear-triangular, long-acuminate, pungent, 6–7 mm. broad at the base, involute when dry; scape erect, slender, about equaling the leaves, sparsely appressed-lepidote; scape-bracts erect, densely imbricate, elliptic, obtuse, thin, red, appressed-lepidote; inflorescence simple, linear-lanceolate, complanate, subdense, 6-flowered, 7 cm. long, 8 mm. wide; rhachis slender, slightly flexuous, deeply excavated, sparsely and obscurely lepidote; floral bracts erect, slightly imbricate but concealing very little of the rhachis, oblong-elliptic, obtuse, 25 mm. long, much exceeding the sepals, ecarinate, enfolding the flowers when dry, thin, bright red, sparsely lepidote; pedicels stout, obconic, 3 mm. long; sepals free, elliptic, obtuse, 12 mm. long, ecarinate, thin, very sparsely and obscurely lepidote; petals 30 mm. long, violet; stamens included, filaments plicate toward apex.

Type in the Gray Herbarium, collected at Huaico, Sierra de la Toma, Province of Loja, Ecuador, altitude ca. 1,400 meters, 1947, by R. Espinosa (No. E 1205).

DISTRIBUTION: Known only from the type.

ECUADOR:

LOJA: Epiphytic, Huaico, alt. ca. 1,400 m., 1947, *R. Espinosa* E-1205 (GH, type).

Like *Tillandsia incarnata* H. B. K., this species has plicate filaments, and for that reason I consider it to be a member of the subgenus *Anoplophytum* in spite of its distichous flowers.

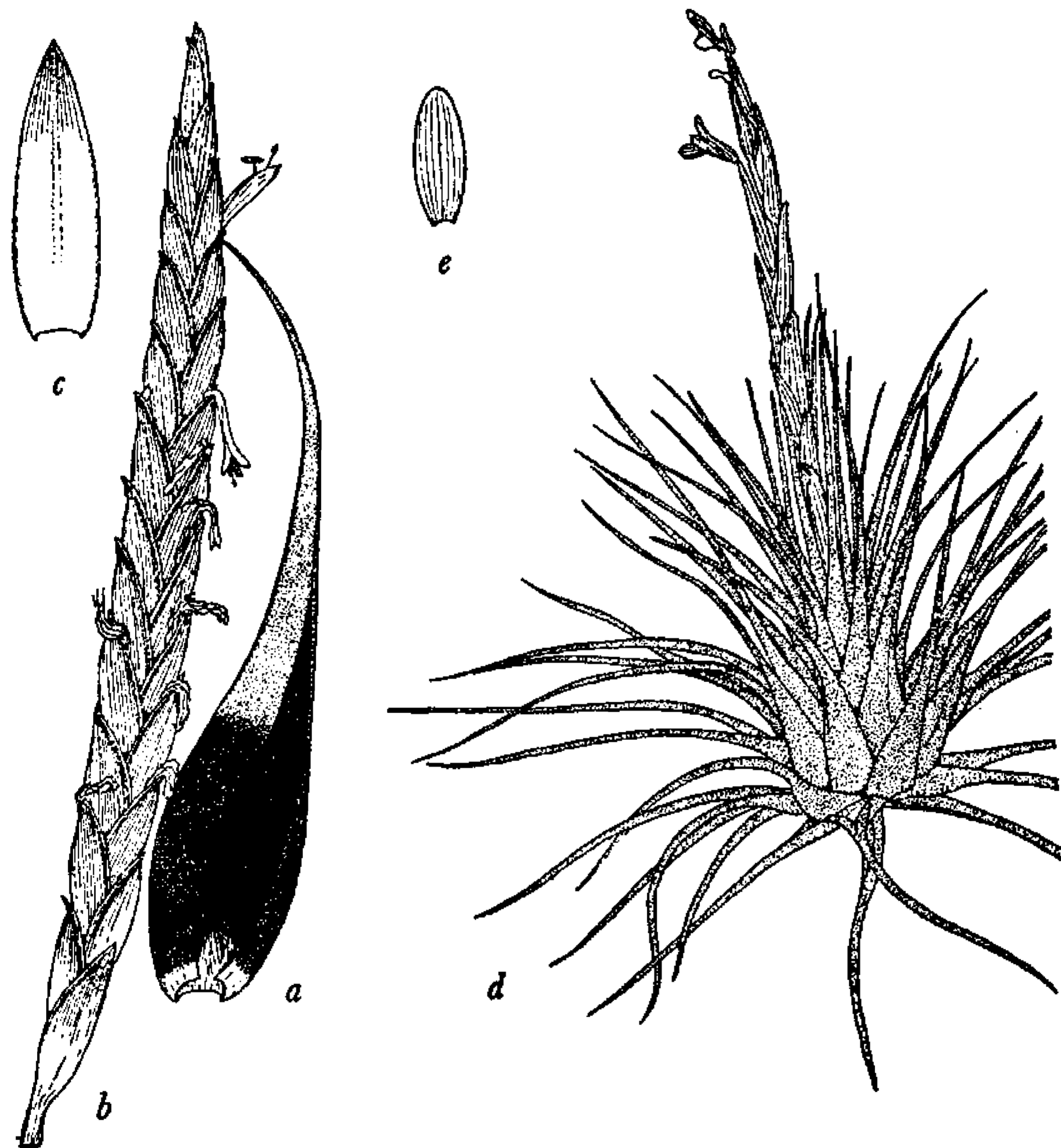


FIGURE 65.—*Tillandsia petraea*: a, Leaf, $\times 1/3$; b, inflorescence, $\times 1/3$; c, sepal, $\times 1$.
Tillandsia espinosae: d, Habit, $\times 1/2$; e, sepal, $\times 1$.

26. *Tillandsia* (*Tillandsia*) *incurva* Griseb. Nachr. Ges. Wis. Goett. for 1864: 15. 1865. FIGURE 66

Tillandsia dactylifera E. Morr. ex Baker, Handb. Bromel. 181. 1889. (! Mez).

Tillandsia digitata Mez in DC. Monogr. Phan. 9: 715. 1896.

Tillandsia castaneo-bulbosa Mez & Wercklé, Bull. Herb. Boiss. II. 3: 140. 1903.

Stemless, 15–40 cm. long with the inflorescence extended; leaves many in a dense subglobose rosette, 15–35 cm. long, very densely and finely appressed-lepidote throughout; sheaths large, distinct,

broadly ovate to suborbicular, dark castaneous; blades triangular, long-acuminate, usually flat, 2-3 cm. wide, cinereous-lepidote; scape arching-decurved, slender, short, much obscured by the leaves,



FIGURE 66.—*Tillandsia incurva*: *a*, Habit, $\times 1/2$; *b*, sepal, $\times 1$.

lepidote at least when young; scape-bracts barely imbricate, tubular-involute, obovate or elliptic, densely appressed-lepidote, at least the lower ones caudate; inflorescence pendulous, simple or digitate with 2-5 spikes; primary bracts like the scape-bracts, scarcely larger than the floral bracts; spikes strict, linear or lance-linear with several sterile bracts at the base, acute, 10-24 cm. long, strongly complanate, 7-16-flowered; rhachis flexuous, slender, strongly angled, lepidote at first; floral bracts erect or slightly divergent, two to three times as long as

the internodes but usually exposing most of the rhachis, elliptic, obtuse, 25–35 mm. long, much exceeding the sepals, ecarinate at maturity, red, submembranaceous, nerved to almost even, appressed-lepidote to glabrous; flowers distinctly pedicellate; sepals elliptic, obtuse or apiculate, 15–20 mm. long, ecarinate, even, soon glabrous, stramineous, thin, free; petals ligulate, 35 mm. long, yellow; stamens exerted at anthesis, anthers linear, 4 mm. long.

TYPE LOCALITY: Near Colonia Tovar, Venezuela. Type collected by Fendler (No. 1524).

DISTRIBUTION: Florida, Greater Antilles, Costa Rica to Venezuela, Bolivia.

UNITED STATES:

FLORIDA:

MONROE COUNTY: On trees, Key West, *Blodgett* (NY).

COSTA RICA: Cultivated, April 1884, *Van Houtte* 6 (Liège, type of *Tillandsia digitata* Mez).

ALAJUELA: La Peña de Zarcero, alt. 1,800 m., April 4, 1938, *A. Smith* H-599 (F, GH).

SAN JOSÉ: On tree, vicinity of Santa María de Dota, alt. 1,500–1,800 m., Dec. 14–26, 1925, *Standley* 41698 (US). On tree in wet forest, Laguna de la Chonta, northeast of Santa María de Dota, alt. 2,000–2,100 m., Dec. 18, 1925, *Standley* 42257 (US). On tree in wet forest, Zurqui, alt. 2,000–2,500 m., Feb. 13, 1926, *Standley & Valerio* 48331, 48338 (US). High in oaks, near Santa María de Dota, alt. 2,400 m., Dec. 15, 1948, *Foster* 2680 (US).

CARTAGO: Forested slopes of Tremendal near San Ramón, alt. 1,300–1,400 m., May 13, 1913, *Tonduz* 17896 (US). On tree, Dulce Nombre, alt. ca. 1,400 m., Feb. 27, 1924, *Standley* 35788 (US). On tree, Las Cóncavas, alt. ca. 1,400 m., Feb. 27, 1924, *Standley* 35977 (US). On tree, La Estrella, Mar. 26, 27, 1924, *Standley* 39533 (US). On tree, vicinity of Orosi, Mar. 30, 1924, *Standley* 39931 (US). On tree, along Río Reventado, north of Cartago, alt. 1,460–1,650 m., Feb. 26, 1926, *Standley & Valerio* 49509, 49575 (US). On tree, El Muñeco, on the Río Navarro, alt. 1,400–1,500 m., Mar. 6, 7, 1926, *Standley & Torres* 51787 (US). Tapantí, alt. 1,300 m., July 15, 1937, *Valerio* 1714 (F). (Las Cóncavas), residence of C. H. Lankester near Cartago, alt. 1,200 m., Dec. 27, 1948, *Foster* 2720 (US).

PANAMA:

CHIRIQUÍ: Epiphytic, vicinity of Finca Lérica, alt. 1750 m., July 7–11, 1940, *Woodson & Schery* 223 (GH).

CUBA:

ORIENTE: Camp La Gloria, south of Sierra Moa, Dec. 24–30, 1910, *Shafer* 8228 (NY). Epiphytic, near Estribo del Pinar, Pico Turquino, Sierra Maestra, alt. ca. 1,900 m., July 23, 1922, *Ekman* 14579 (GH). Epiphytic by the base of large boulders, summit of Loma del Gigante near Río Guisa, Sierra Maestra, Jan. 4, 1923, *Ekman* 16093 (GH). Slopes of Pico Turquino, May 19, 1948, *Acuña* 15063 (Vegas).

HAITI:

L'OUEST: On pine trunks, common, base of Guimbi Galata, Mornes des Commissaires, Oct. 14, 1943, *Holdridge* 1774 (US).

SAN DOMINGO:

SAN JUAN: Epiphyte, hillslopes, near Río Arriba del Norte, north of San Juan, Sept. 9–14, 1946, *Howard* 8938 (GH).

JAMAICA:

SURREY: Cinchona, Blue Mountains, leeward slopes, *Harris & Lawrence* C-15211 (US).

VENEZUELA:

FEDERAL DISTRICT: On tree, mountains near Galipán, Oct. 25, 1921, *E. Pittier* 121 (US). Caracas, mountains near Sanchorquiz, alt., 1,500-1,800 m., *Ernst* (! *Mez*, type of *Tillandsia dactylifera* E. Morr. ex Baker).

ARAGUA: Near Colonia Tovar, alt. 2,000 m., 1854-55, *Fendler* 1524 (GH, type collection).

BOLÍVAR: On small tree trunk, lower southeastern slopes of Carrao-tepui, alt. 1,675-1,980 m., Dec. 5, 6, 1944, *Steyermark* 60858 (F, GH).

COLOMBIA:

NORTE DE SANTANDER: Epiphytic, between Ocaña and Convención, alt. 1,200 m., Sept. 20, 1946, *Foster* 1746 (GH).

CUNDINAMARCA: On trees, Paramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1879 (GH).

CAUCA: On tree trunks, near El Tambo, alt. 1,800 m., April 24, 1934, *Sneidern* 72 (S). In virgin forest, Munchique, near El Tambo, alt. 2,900 m., April 28, 1936, *Sneidern* 665 (S).

BOLIVIA:

LA PAZ: Larecaja: Mapiri region, San Carlos, alt. 850 m., Dec. 2, 1926, *Buchtien* 373 (US).

27. *Tillandsia* (*Tillandsia*) *patula* Mez, Repert. Nov. Sp. Fedde 3: 35. 1906.

FIGURE 67

Stemless, stout, 4 dm. high; leaves many in a subglobose rosette, 2 dm. long, densely lepidote, brownish gray; sheath very broad, ovate-

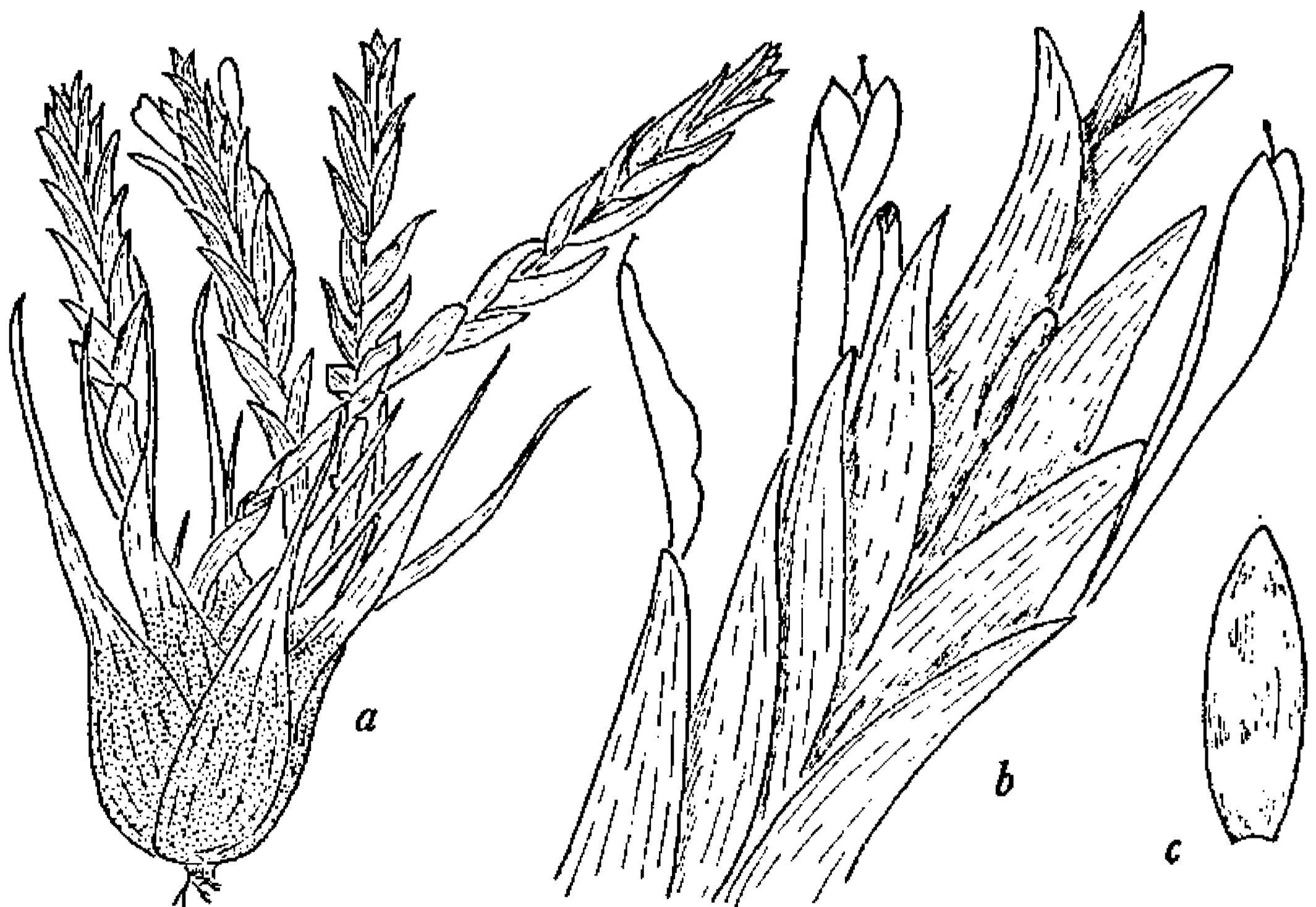


FIGURE 67.—*Tillandsia patula*: a, Habit, $\times 1/5$; b, apex of inflorescence, $\times 1$; c, sepal, $\times 1$. (Drawn by R. J. Downs.)

triangular, dark brown; blade linear-triangular, long-acuminate, involute-subulate toward the apex, 25 mm. broad at the base, rigid;

scape stout, suberect to decurved, shorter than the leaves; scape-bracts imbricate, elliptic, lepidote, only the lowest laminate; inflorescence simple, erect or pendulous, 16 cm. long, 4 cm. wide; rhachis straight, sharply angled, glabrous; floral bracts imbricate but so narrow as to reveal the rhachis, 45 mm. long, much exceeding the sepals, 12 mm. apart, oblong, obtuse or apiculate, recurved-spreading at the apex, ecarinate, subcoriaceous, glabrous, striate, rose (! Weberbauer); flowers suberect, short-pedicellate, 7 cm. long; sepals free, elliptic, narrowly obtuse, 24 mm. long, nerved, glabrous, ecarinate; petals erect, narrowly obtuse, yellow (! Weberbauer); stamens and pistil exserted.

TYPE LOCALITY: Above Huacapistana on the Palca road, Junin, Peru. Type collected by Weberbauer (No. 2012).

DISTRIBUTION: Vicinity of the type locality.

PERU:

JUNIN: Prov. Tarma, above Huacapistana on the Palca road, alt. 1,900–2,000 m., Jan. 7, 1903, *Weberbauer* 2012 (Berlin, type, Macbride photo No. 11520). Open hillside, Carpapata, above Huacapistana, alt. ca. 2,400 m., June 7, 1929, *Killip & Smith* 24349 (US). Common, crevices of sandstone cliff, between Palca and Carpapata, alt. 2,900 m., Mar. 18, 1939, *Stork* 10963 (F).

28. *Tillandsia* (*Tillandsia*) *pueblensis* L. B. Smith, *Contr. Gray Herb.* 104: 81, pl. 3, figs. 1, 2. 1934. FIGURE 68

Stemless, 16–24 cm. high; leaves rosulate, densely pruinose-gray-lepidote, the outer reduced to pointed sheaths, the inner up to 16 cm. long, often recurved; sheaths scarcely distinct; blades narrowly triangular, about 10 mm. wide at the base, involute, pungent; scape erect, short; lower scape-bracts foliaceous, long-laminate, the upper ones lanceolate, acute, membranaceous, appressed-lepidote; inflorescence simple, linear-lanceolate, laxly 5–7-flowered, up to 9 cm. long, 1 cm. broad; floral bracts erect, narrowly lanceolate, acute, ecarinate, imbricate but not always concealing the rhachis, 25–40 mm. long, membranaceous, strongly nerved, appressed-gray-lepidote, bright rose; flowers sessile; sepals narrowly lanceolate, acute, 20 mm. long, membranaceous, nerved, carinate, glabrous, the posterior ones connate for 6 mm.; petals violet, 4 cm. long, tubular-convolute; stamens and pistil exserted.

TYPE LOCALITY: Zapotitlán, Puebla, Mexico. Type collected by Purpus (No. 5856).

DISTRIBUTION: Mexico.

MEXICO:

PUEBLA: Tehuacán, Mar. 1904, *Trelease* 130/04/17 (MO). Zapotitlán, April 1912, *Purpus* 5856 (GH, type; BM, F, MO, NY, UC, US).

OAXACA: Oaxaca, May 20, 1906, *Pringle* 13856 (US), 13857 (GH, US).

29. *Tillandsia* (*Tillandsia*) *achyrostachys* E. Morr. ex Baker, Handb. Bromel. 171. 1889. FIGURE 68

Stemless, 2–4 dm. high; leaves densely rosulate, 20–27 cm. long, very densely and finely appressed-cinereous-lepidote throughout; sheaths erect, subtriangular, elongate, merging insensibly into the blade; blades usually curved-spreading, very narrowly triangular, filiform-acuminate, 1 cm. wide, flat; scape erect; scape-bracts densely imbricate, the lower foliaceous, the upper broadly elliptic, filiform-caudate or apiculate, chartaceous, densely lepidote; inflorescence



FIGURE 68.—*Tillandsia pueblensis*: *a*, Habit, $\times 1/4$; *b*, posterior sepals, $\times 1$, after L. B. Smith, Contr. Gray Herb. *Tillandsia achyrostachys*: *c*, Habit, $\times 1/4$; *d*, posterior sepals, $\times 1$. *Tillandsia achyrostachys* var. *stenolepis*: *e*, Inflorescence, $\times 1/2$.

simple, densely distichous-flowered or sometimes the lower flowers polystichous (! Mez), linear, acute, 1–2 dm. long, terete or subterete at anthesis, 8–15 mm. in diameter, glabrous; floral bracts erect, densely imbricate, ovate, acute, 3–4 cm. long, exceeding the sepals, three to four times as long as the internodes, ecarinate, chartaceous, closely and strongly nerved, bright red; flowers sessile; sepals lanceolate, acuminate, up to 26 mm. long, carinate, membranaceous, prominently nerved, short-connate posteriorly; petals erect, 45 mm. long, ligulate, obtuse, yellow; stamens and pistil exerted; capsule slenderly ellipsoid, abruptly short-beaked, barely exceeding the sepals.

TYPE LOCALITY: "Mexico." Described from cultivation.

DISTRIBUTION: Central to southern Mexico.

MEXICO: Morren drawing made April 1881 from a plant received from Kienast of Zurich (K, type).

PUEBLA: Izucar de Matamoros, Dec. 1884, *Com. Geogr. Explor. Rep. Mex.* 372 (F, GH). Mountains, near Tehuacán, Dec. 1895, *Pringle* 7025 (US).

MORELOS: Yautepec, Aug. 27, 1903, *Rose & Painter* 719 (US). Near Cuernavaca, Sept. 9, 1903, *Rose & Painter* 8070 (US). Canyon del Lobo, alt. 1,800 m., Jan. 15, 1932, *Fröderström & Hultén* 160 (NY, S).

OAXACA: Cerro de San Felipe, Jan. 15, 1899, *Conzatti & Gonzales* 947 (GH). Lachatao, Oaxaca, Dec. 24, 1947, *MacDougall* (US).

29a. *Tillandsia achyrostachys* E. Morr. ex Baker var. *stenolepis* L. B. Smith, var. nov. FIGURE 68

Differt bracteis florigeris angustioribus.

Floral bracts narrow, not altogether concealing the rhachis, not over 3 cm. long.

Type in the U. S. National Herbarium, No. 934346, collected on burseras, hills near Guadalajara, Jalisco, Mexico, June 25, 1892, by C. G. Pringle (No. 4111).

DISTRIBUTION: Northern to central Mexico.

MEXICO: Barrancas, May 25, 1849, *Gregg* 896 (MO).

CHIHUAHUA: Candemeña River, Río Mayo headwaters, June 23, 1937, *LeSeur* 1288 (F, GH, MO).

DURANGO: Epiphytic, Corral de Piedra on Río Piaxtla, alt. 1,200 m., April 10, 1943, *Lundell* 13007 (GH, Lundell). Ojito, above Corral de Piedra on Río Piaxtla, alt. 1,500 m., April 12, 1943, *Lundell* 13011 (Lundell).

NAYARIT: Hills west of Ahuacatlán ("Agua Catlan"), May 25, 1849, *Gregg* 995 in part (MO).

JALISCO: Bluffs of barranca, near Guadalajara, Sept. 28, 1891, *Pringle* 5170 (GH). On *Bursera*, hills near Guadalajara, June 25, 1892, *Pringle* 4111 (US, type: F, GH, MO, NY). Between Bolaños and Guadalajara, Sept. 19, 1897, *Rose* 3022 (US). Epiphytic, barranca near shrine, southeast of Ciudad Guzman, Oct. 23, 1940, *Moore* 173 (GH).

GUANAJUATO: Mountains of Santa Rosa, 1901, *Duges* (GH).

MICHOACÁN: Epiphytic, dry roadside, about 70 km. from Temascal on road to Huetamo, Nov. 13, 1949, *Moore, Hernandez, & Porras* 5683 (Bailey Hort.).

OAXACA: Between Totolapa and San Carlos, alt. 900–1,140 m., April 19, 20, 1895, *Nelson* 2545 (US).

30. *Tillandsia* (Phytarrhiza) *triglochinosides* Presl, Rel. Haenk. 1: 125. 1827.

FIGURE 69

Tillandsia hartwegiana Brongn. ex Baker, Handb. Bromel. 171. 1889. Nomen, in synonymy.

Stemless, to 3 dm. high; leaves few in a lax rosette, 2 dm. long, appressed-lepidote; sheaths hardly distinct; blades linear-triangular, long-acuminate, subpungent, rigid, 7 mm. broad, cinereous or yellowish; scape slender, erect, shorter than the leaves; scape-bracts tubular-erect, imbricate and wholly concealing the scape, sublanceolate, acute, lepidote toward the apex; inflorescence simple, rather lax, very narrowly lanceolate or linear, acute, strongly complanate, ca. 13 cm. long, 8 mm. wide, about 22-flowered; rhachis slightly but distinctly

undulate, not much thickened at the base of the flowers; floral bracts erect or suberect, scarcely or not all all imbricate, about 7 mm. apart, triangular-ovate, ecarinate, 19 mm. long, 8 mm. wide, enfolding and exceeding the sepals, submembranaceous, prominently nerved, glabrous; flowers subsessile; sepals equally very short-connate, lance-ovate, acute, to 12 mm. long, scarcely carinate, coriaceous, nearly even, lustrous; petals about 9 mm. longer than the sepals, claw linear, blade broadly lanceolate, acute, reflexed at anthesis, yellow (! Hartweg); stamens deeply included.

TYPE LOCALITY: Guayaquil, Ecuador. Type collected by Haenke.

DISTRIBUTION: Southern Ecuador.

ECUADOR:

GUAYAS: Guayaquil, 1790-91, *Haenke* (Prague, type). In woods near Zamborondón, Mar. 1842 (?), *Hartweg* 699 (K; Vienna, Macbride photo No. 29986).

EL ORO: On tree along river, Portovelo (gold mine near Zaruma), alt. 600-1,000 m., Aug. 30-Sept. 1, 1923, *Hitchcock* 21219 (GH, NY, US); on tree, dry hill, *Hitchcock* 21246 (GH, NY, US).

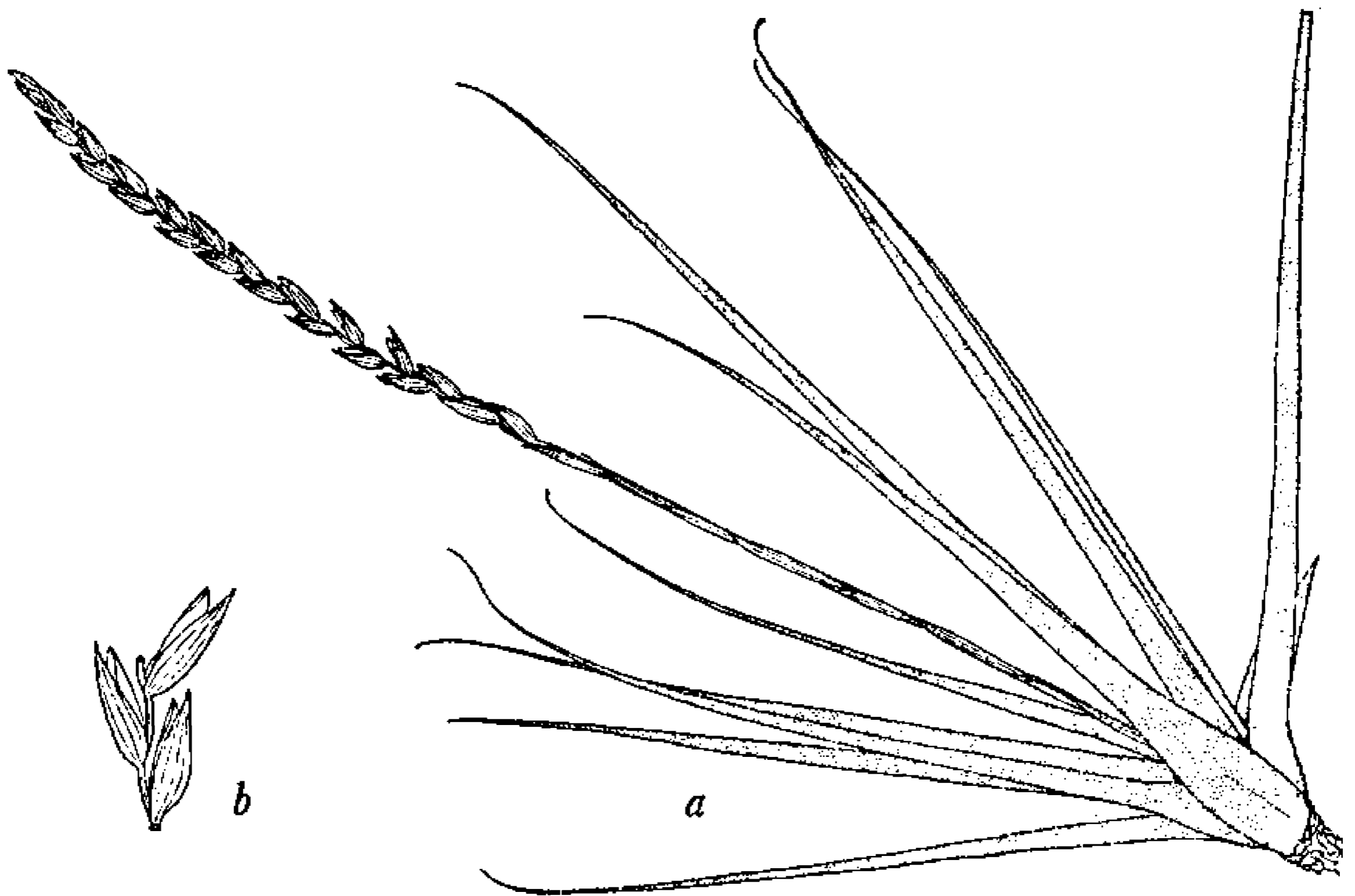


FIGURE 69.—*Tillandsia triglochinoides*: *a*, Habit, $\times 1/2$; *b*, section of inflorescence, $\times 1$.

31. *Tillandsia* (*Tillandsia*) *argentea* Griseb. Cat. Pl. Cub. 254. 1866.

FIGURE 70

Plant 25 cm. high; stem curved, very short but often branched; leaves many in a dense rosette, spreading, 6-9 cm. long, densely covered with white or ferruginous appressed to slightly spreading scales; sheaths subtriangular, small, scarcely distinct from the blade; blades linear-subulate, filiform-acuminate, rigid, 1-2 mm. wide at the base; scape erect or ascending, exceeding the leaves, 1 mm. in

diameter, bright red, glabrous; scape-bracts erect, partially clasping the scape, exceeding the internodes or the uppermost sometimes slightly shorter, ovate, abruptly acute or caudate, 8 mm. long without the caudate apex, chartaceous, prominently nerved, bright red, at least the lowest densely appressed-lepidote; inflorescence simple, 7 cm. long, lax, up to 6-flowered with the rudiment of a seventh at the apex; rhachis geniculate, slender, angled, glabrous; floral bracts equaling or shorter than the internodes, broadly elliptic, acute or apiculate, 11 mm. long, much shorter than the sepals, membranaceous, densely appressed-lepidote; flowers subspreading; pedicels distinct, stout, 2–5 mm. long; sepals elliptic, obtuse, 14 mm. long, 5 mm. wide, submembranaceous, prominently nerved, appressed-lepidote, becoming glabrous with age, free; petals ligulate, obtuse, 3 cm. long, bright red or purple; stamens exserted, shorter than the pistil; capsule 4–5 cm. long, slender, acute.

TYPE LOCALITY: near Monteverde, Oriente, Cuba. Type collected by Charles Wright.

DISTRIBUTION: Mexico, Guatemala, Cuba, Jamaica.

MEXICO:

SINALOA: Foothills of the Sierra Madre, near Colomas, *Rose* 1708 (US).

GUERRERO: Mina District: On cliff, I. R. F. del Oro, Trincheras, May 2, 1937, *Hinton et al.* 10126 (GH).

OAXACA: Between San Carlos and San Bartolo, alt. 900–1,440 m., April 21, 1895, *Nelson* 2561 (US).

CHIAPAS: Mount Ovando, Feb. 1939, *Matuda* 2642 (NY). La Grandeza, alt. 2,016 m., May 19, 1945, *Matuda* 5605 (GH).

GUATEMALA:

QUICHÉ: Abundant, on tree, dry rolling hills with pine and oak forest, between Quiché and San Pedro Jocopilas, alt. 1,800–2,100 m., Jan. 12, 1939, *Standley* 62454 (F, GH).

HUEHUETENANGO: On tree, often in dense clumps, along road 13 km. west of Huehuetenango, near Puente de Xinxó, alt. ca. 1,800 m., Dec. 30, 1940, *Standley* 81485 (GH).

SAN MARCOS: Finca El Porvenir, on Potrero Matasán along Río Cabús, Volcán Tajumulco, alt. 1,000–1,300 m., Mar. 12, 1940, *Steyermark* 37637 (F, GH).

QUEZALTENANGO: On tree in dense forest, along old road between Finca Pirincos and Patzulín, alt. 1,200–1,400 m., Feb. 9, 1941, *Standley* 86983 (GH).

SUCHITEPÉQUEZ: Upper slopes of barranco, lower slopes of Volcán Zunil, near Finca Montecristo, southeast of Santa María de Jesús, alt. 1,200–1,300 m., Jan. 31, 1940, *Steyermark* 35214 (F, GH).

CUBA:

ORIENTE: Near Monte Verde, 1859, *C. Wright* No. a (GH, type collection). On tree in woodlands, near El Cuero, alt. 330 m., Mar. 18, 19, 1912, *Britton & Cowell* 12744 (NY). Epiphytic, by Río Potrerillo, El Dean, Costa Sur, Niquen, July 30, 1935, *Roig, Acuña, & Baker* 6571 (NY, Vegas).

JAMAICA: *Wolle* (GH).

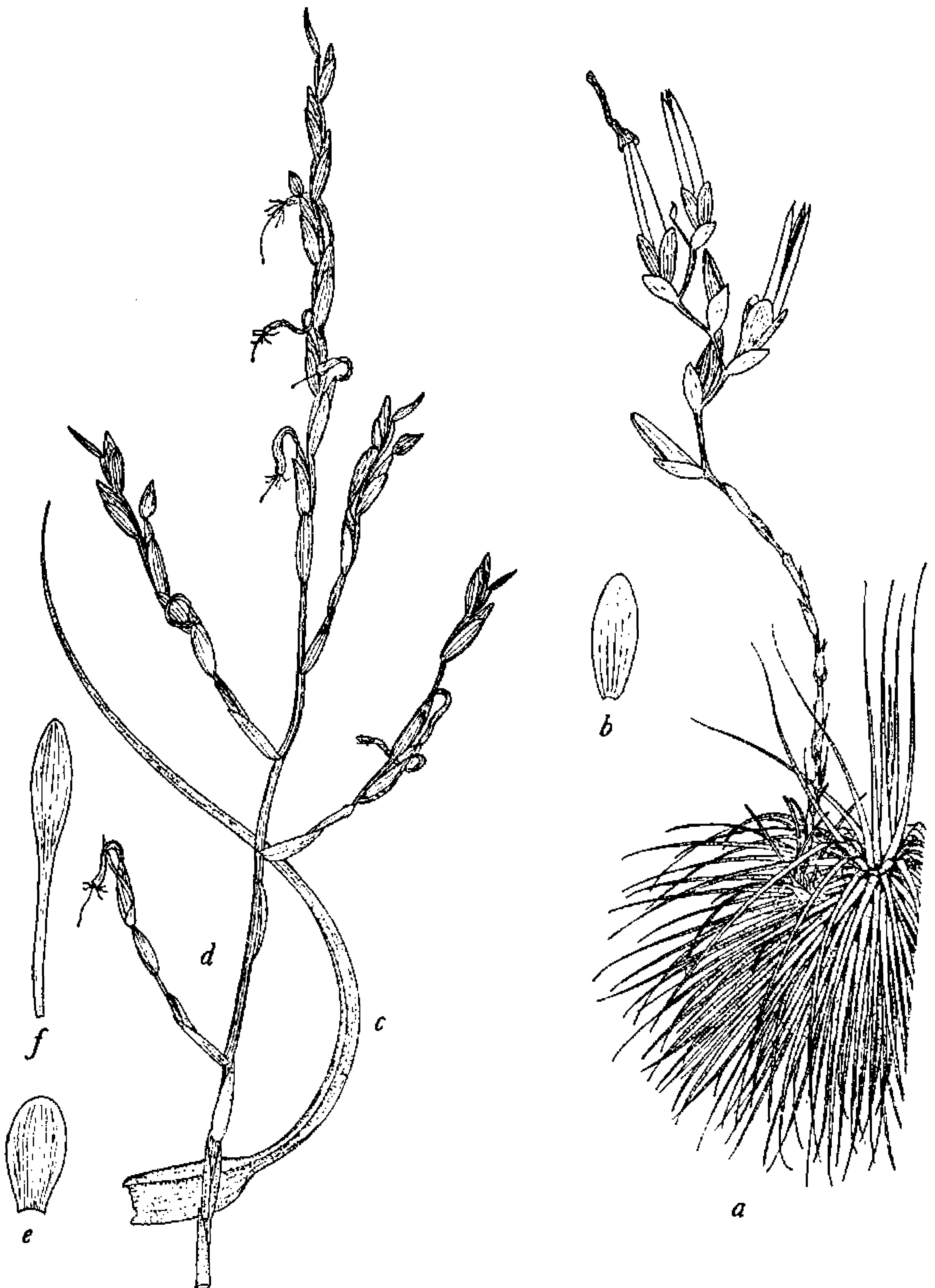


FIGURE 70.—*Tillandsia argentea*: *a*, Habit, $\times 1/2$; *b*, sepal, $\times 1$. *Tillandsia karwinskyana*: *c*, Leaf, $\times 1/2$; *d*, inflorescence, $\times 1/2$; *e*, sepal, $\times 1$; *f*, petal, $\times 1$.

32. *Tillandsia* (*Tillandsia*) *karwinskyana* Schult. in Roem. & Schult. Syst. Veg. 7: 1209. 1830. FIGURE 70

Tillandsia pringlei S. Wats. Proc. Amer. Acad. 26: 155. 1891.

Stemless, 4–6 dm. high; leaves in a dense fasciculate rosette, 15–20 cm. long, densely and persistently lepidote throughout with coarse

spreading to appressed scales; sheaths ovate or triangular, small, sometimes castaneous; blades linear-triangular, acuminate, 1 cm. wide at the base, cinereous-lepidote; scape erect, 2–3 mm. in diameter, equaling or exceeding the leaves, glabrous; scape-bracts erect, involute, appressed-cinereous-lepidote, the lower foliaceous, densely imbricate, the upper elliptic, acute or apiculate, submembranaceous, bright red, barely exceeding the internodes; inflorescence simple or few-branched; primary bracts like the upper scape-bracts, not attaining the lowest flower of the axillary spikes; spikes suberect, linear, laxly 4–8-flowered, 10–15 cm. long, long-stipitate with a single sterile bract at the base; rhachis flexuous, angled, sulcate, glabrous; floral bracts erect, ovate, acute, 15–20 mm. long, much shorter than the sepals, glabrous or sparsely lepidote, prominently nerved, submembranaceous with a thinner often blackish margin; flowers strict, appressed to the rhachis; pedicels very short and stout; sepals elliptic, obtuse, 23 mm. long, glabrous, prominently nerved, submembranaceous, short-connate; petals erect, linear, 35 mm. long, greenish yellow; stamens exerted, the filaments undulate when dry.

TYPE LOCALITY: "Mexico." Type collected by Karwinski.

DISTRIBUTION: Northeastern Mexico.

MEXICO: *Karwinski* (M, type); June 20, 1936, *Foster* 1160 (GH).

NUEVO LEÓN: Common over small areas on limestone cliffs facing west, Sierra Madre Oriental, Canyon Santa Ana to Alamar, about 15 miles southwest of Galeana, July 2, 1934, *Mueller* 960 (GH).

SAN LUIS POTOSÍ: Las Palmas, June 4, 1890, *Pringle* 3530 (GH, type of *Tillandsia pringlei* S. Wats.). On rocks and trees, Las Canoas, June 10, 1891, *Pringle* 3738 (F, GH, MO, NY, US). On rocks, Sierra de Guascama, Minas de San Rafael, June, 1911, *Purpus* 5367 (F, GH, NY).

HIDALGO: On limestone boulders, dry pine-oak woods, Puerto de la Zorra, near Km. 284 on highway northeast of Jacala, alt., 1,500 m., Oct. 27, 1946, *Moore* 1682 (US); April 27, 1947, *Moore* 2658 (US). On shrub, thickets between Hilo Juanico and Barranca Seca on trail from Jacala to Pacula, alt. 1,400–1,600 m., July 9, 1948, *Moore & Wood* 3841 (US).

PUEBLA: Near Tehuacán, Aug.–Sept. 1905, *Rose, Painter, & Rose* 9972 (US).

Baker's descriptions of this species in the *Gardeners, Chronicle*, in the *Journal of Botany*, and in his *Handbook*, are all based on a single collection by Sargent and speak of the leaves as glabrous on one side and thinly lepidote on the other. Thus it seems very doubtful that he had *Tillandsia karwinskyana*.

33. *Tillandsia* (Phytarrhiza) *monadelpha* (E. Morr.) Baker, *Journ. Bot. Brit. & For.* 25: 281. 1887. FIGURE 71

Phytarrhiza monadelpha E. Morr., *Belg. Hort.* 32: 168, pl. 7. 1882.

Tillandsia graminifolia Baker, *Journ. Bot. Brit. & For.* 25: 281. 1887.

Catopsis (*Andrea*) *alba* E. Morr. ex Baker, *Handb. Bromel.* 192. 1889. Nomen, in synonymy.

Tillandsia monobotrya Mez, *Repert. Sp. Nov. Fedde* 16: 77. 1919.

Tillandsia digitata sensu Standl., *Smithsonian Misc. Coll.* 78: No. 8:12. 1927. Non Mez.

Stemless, flowering plant 35 cm. high; leaves densely rosulate, 2 dm. long, obscurely punctulate-lepidote; sheaths ovate; blades very narrowly triangular, 10–15 mm. wide; scape erect, soon becoming lateral, slender, glabrous; scape-bracts lance-elliptic, imbricate, lepidote at the apex; inflorescence simple, linear-oblong, much compressed, about 22-flowered, appearing lax by the spreading of the flowers, 13

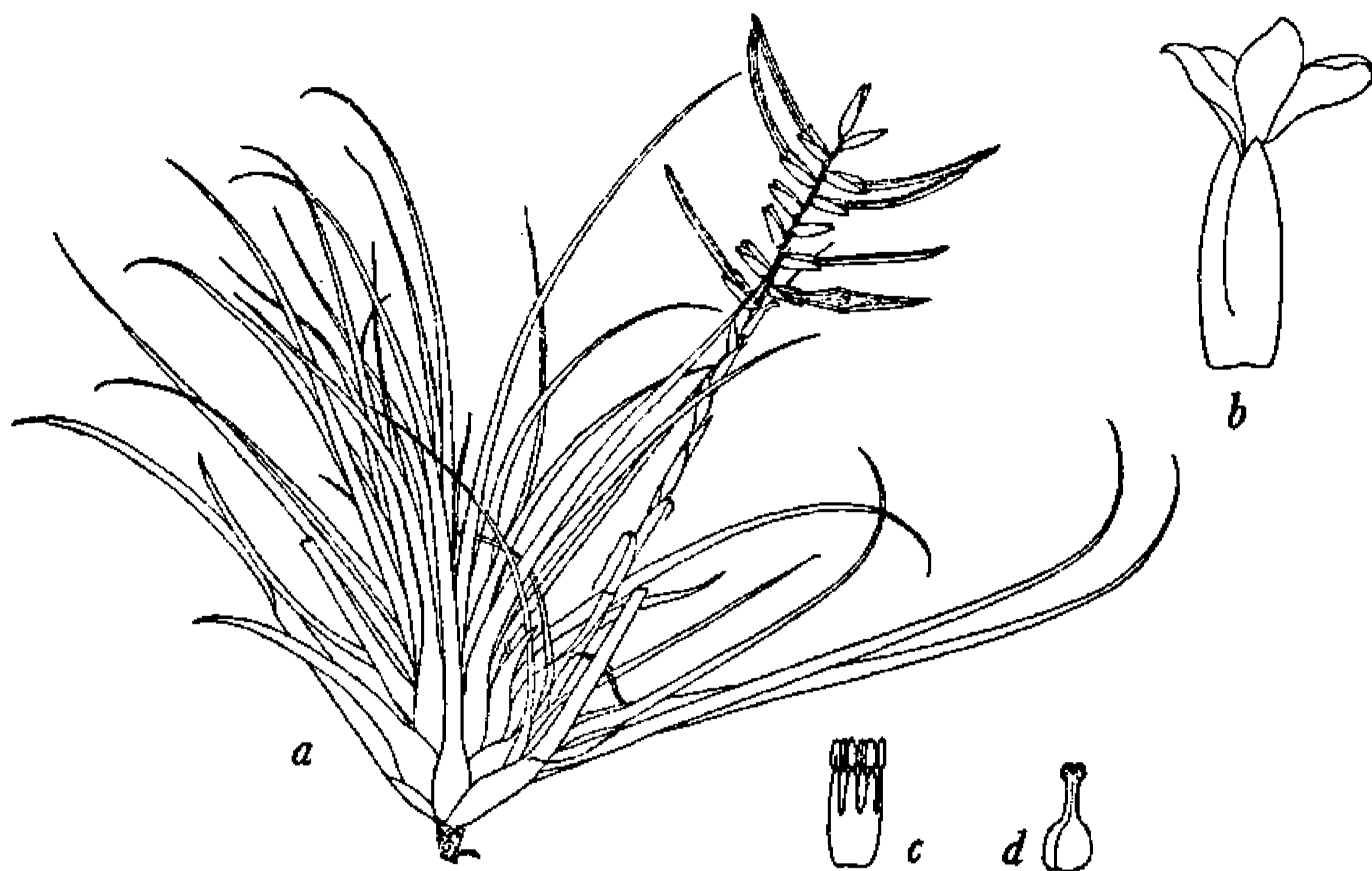


FIGURE 71.—*Tillandsia monadelpha*: *a*, Habit, $\times 1/4$; *b*, flower, $\times 1$; *c*, stamens $\times 1$; *d*, pistil $\times 1$, details after E. Morren, Belg. Hort.

cm. long; rhachis straight, alate-angled; floral bracts ovate, acute, 17 mm. long, equaling the sepals, coriaceous or subcoriaceous, carinate, striate, sparsely lepidote, soon glabrous; flowers sessile, spreading, 30 mm. long; sepals equally short-connate, glabrous, lance-elliptic, carinate; petals white or yellow (! Schipp), the blades ovate, reflexed; stamens deeply included, exceeding the style, filaments connate; capsule slenderly cylindric, 4–7 cm. long.

ILLUSTRATIONS: ANN. MISSOURI BOT. GARD. 31: *fig. 108*; Publ. Carnegie Inst. Washington 522: *fig. 7*.

TYPE LOCALITY: South America. Described from cultivation.

DISTRIBUTION: Central America, Trinidad, northern South America.

GUATEMALA:

ALTA VERAPAZ: Finca Tres Aguas, alt. 300 m., April 16, 1907, *Goll 117* (US).

IZABAL: On tree, wet forest near Entre Ríos, alt. ca. 18 m., April 30, 1939.

Standley 72747 (F). Epiphytic, Río Dulce, between Livingston and 6 miles up river on north side, alt. 1–25 m., April 14, 1940, *Steyermark 39373* (F). Epiphytic, along Río Dulce below junction with Río Tameja, Dec. 28, 1941, *Steyermark 42017* (F, GH).

BRITISH HONDURAS:

STANN CREEK DISTRICT: Occasional, epiphytic in dense forest, Middlesex, alt. 60 m., Sept. 26, 1929, *Schipp* 390 (F, GH, MICH, MO). On tree in high ridge, Stann Creek Valley, Antelope Ridge, Feb. 1940, *Gentle* 3193 (GH, NY).

HONDURAS:

ATLÁNTIDA: On tree, Lancetilla Valley near Tela, alt. 20–600 m., Dec. 1927–Mar. 1928, *Standley* 53195 (F); 53386, 53503 (F, US); 53959, 54193 (F); 54811 (F, GH, US); 55625 (F); alt. 450 m., June–July, 1929, *Chickering* 99 (MICH); 124 (F, MICH); alt. 150 m., July 24, 1934, *Yuncker* 5089 (F, MICH, MO).

COSTA RICA:

GUANACASTE: On tree, El Silencio near Tilarán, alt. ca. 750 m., Jan. 13, 1926, *Standley & Valerio* 44783 (US). On tree, El Arenal, alt. 485–600 m., Jan. 18, 19, 1926, *Standley & Valerio* 45123 (US). On tree, Los Ayotes near Tilarán, alt. 600–700 m., Jan. 21, 1926, *Standley & Valerio* 45601, 45611, 45626 (US). On tree in moist forest, La Tejona, north of Tilarán, alt. 600–700 m., Jan. 25, 1926, *Standley & Valerio* 46031 (US). On tree in moist forest, Quebrada Serena, southeast of Tilarán, alt. ca. 700 m., Jan. 27, 1926, *Standley & Valerio* 46263 (US).

LIMÓN: On tree, La Colombiana Farm of the United Fruit Co., alt. ca. 70 m., Mar. 6, 7, 1924, *Standley* 36827, 37310 (US). On tree in wet forest, Finca Montecristo, on the Río Reventazón below Cairo, alt. ca. 25 m., Feb. 18, 19, 1926, *Standley & Valerio* 48946, 48993 (US). Forest near farmhouse at Finca Castilla, alt. 30 m., July 23–29, 1936, *Dodge & Goerger* 9269 (GH, MO).

LIMÓN OR CARTAGO (?): Baguar, alt. 45 m., June 17, 1874, *Kuntze* 2009 (NY).

CARTAGO: Azul, Turrialba, alt. 650 m., Mar. 1908, *Wercklé* 150, in *hb. Mus. Nac. Costa Rica* 17444 (Berlin, type of *Tillandsia monobotrya* Mez, Macbride photo No. 11513). On tree, near Pejivalle, alt. ca. 900 m., Feb. 7, 8, 1926, *Standley & Valerio* 47236 (US). Epiphytic (Las Cóncevas) residence of C. H. Lankester, near Cartago, alt. 1,200 m., Dec. 17, 1948, *Foster* 2700 (US).

PANAMA:

COCLÉ: El Valle de Antón, alt. 1,000 m., June 5, 1939, *Alston* 8795 (BM). Epiphytic, north of El Valle de Antón, near La Mesa, alt. ca. 1,000 m., Nov. 12, 1941, *Allen* 2782 (GH).

CANAL ZONE: Hills around the Agua Clara Reservoir, near Gatún, alt. 20–30 m., Feb. 5, 1911, *H. Pittier* 2658 (US). Wet forest, Barro Colorado Island, Gatún Lake, alt. ca. 120 m., Nov. 1925, *Standley* 41169 (US); Aug. 15, 1927, *Kenoyer* 214 (US); Nov. 2, 1931, *Shattuck* 552 (F). Westerly arm of Quebrada Salamanca, alt. 75 m., Dec. 16, 1934, *Dodge, Steyermark, & Allen* 17024 (GH, MO).

DARIÉN: Cana-Cuasi Trail (Camp 2), Chepigana District, alt. 600 m., Mar. 13, 1940, *Terry* 1546 (F).

TRINIDAD: *Fendler* 828 (! Baker); *Broadway* 2807 (! Mez). Chaguanas, May 1868, *Finlay* 2004 (NY, TRIN); April 1889, *Broadway* 3741 (TRIN). Arima, 1906, *Dannouse* (TRIN). On tree, Tamana forests, Feb. 16, 1915, *Broadway* 7808 (TRIN); April 27, 1915, *Broadway* 7818 (TRIN). Forest near Tabaquite, Mar. 26–28, 1921, *Britton, Freeman, & Nowell* 2574 (NY).

FRENCH GUIANA: 1842, *Melinon* 134 (P). Karduan, 1855, *Sagot* 859 (P).

BRITISH GUIANA:

NORTHWEST DISTRICT: Short cut, Waini River, July 1906, *Becket* 8521 (Jenman, NY, US). Epiphytic, Mount Everard, Feb. 12, 1922, *Cruz* 1301 in part (NY). Amakura River, latitude 8°10' N., longitude 60° W., Mar. 23–30, 1923, *Cruz* 3562 (F, GH, MO, NY, US). On overhanging tree along Amakura River, Yarikita Police Station, junction of Yarikita and Amakura Rivers, Jan. 17, 18, 1920, *Hitchcock* 17636 (GH).

ESSEQUEBO: Epiphytic, Essequibo River, Moraballi Creek, near Bartica, near sea-level, Aug. 21, 1929, *Sandwith* 79 (NY).

RUPUNUNI DISTRICT: Epiphytic, upper Rupununi River, near Dadanawa, latitude 2°45' N., June 16, 1922, *Cruz* 1539 (GH, NY, US).

COLOMBIA:

EL VALLE: Epiphytic, forest, Santa Rosa, Dagua Valley, alt. 200–300 m., Sept. 22, 1922, *Killip* 11532 (GH, NY, US). Epiphytic, woods, Río Cajambre, Pacific coast, alt. 5–80 m., May 5–15, 1944, *Cuatrecasas* 17465 (GH). Epiphytic, dense forest, Agua Clara, along highway from Buenaventura to Cali, alt. ca. 100 m., June 6, 1944, *Killip & Cuatrecasas* 38879 (GH, US).

CAUCA: Timbiquí, *Lehmann* 8637 (F).

NARIÑO: Epiphytic, dense forest along stream, east side of Gorgona Island, alt. 50–100 m., Feb. 11, 1939, *Killip & Garcia* 33182 (GH, US).

ECUADOR: *Eggers* 15252 (K). Puente de Chimbo, alt. 300–1,000 m., *Lehmann* 5303 (F).

FROM CULTIVATION: June 15, 1875, *Hort. Linden* (Liège, probable basis of drawing at Kew that is the type of *Catopsis (Andrea) alba* E. Morr. ex Baker).

The type of *Tillandsia monadelphæ* is a cultivated plant from Linden. Very likely it is the same plant that is the type of *Catopsis alba*.

34. *Tillandsia (Phytarrhiza) narthecioides* Presl. Rel. Haenk. 1: 125. 1827.

FIGURE 72

Stemless or very short-caulescent, about 45 cm. high; leaves 20–30 in a dense rosette, all or nearly all erect, 20–40 cm. long; sheaths elongate, scarcely distinct, covered with a ferruginous membrane of appressed scales; blades long-acuminate, 5 mm. wide or less, sparsely and minutely lepidote beneath, subchartaceous when dry; scape very slender, erect, much shorter than the leaves; scape-bracts tubular-involute, erect, the lower imbricate, the upper elliptic, obtuse, 15 mm. long, equaling the internodes, purple (! Camp); inflorescence simple, lax, linear, to 30-flowered, 12 cm. long, 25 mm. wide; rhachis completely exposed, glabrous, regularly undulate especially toward the apex, not at all thickened at the bases of the flowers, internodes ca. 6 mm. long; floral bracts spreading, linear-elliptic, obtuse, ca. 13 mm. long, equaling the sepals, 3.5–4 mm. wide, scarcely carinate, glabrous outside, prominently nerved, chartaceous; flowers sessile; sepals equally subfree, elliptic, obtuse, coriaceous, glabrous, prominently nerved; petals white, the blades spreading, 6 mm. long; stamens deeply included, exceeding the pistil, filaments high-connate; capsule slenderly cylindrical, acute, to 36 mm. long.



FIGURE 72.—*Tillandsia narthecioides*: *a*, Habit, $\times 1/5$; *b*, section of inflorescence, $\times 1$; *c*, sepals and capsule, $\times 1$. (Drawn by R. J. Downs.)

TYPE LOCALITY: Guayaquil, Ecuador Type collected by Haenke.

DISTRIBUTION: Region of the Province of Guayas, Ecuador.

ECUADOR: April 26, 1892, *Eggers* 14272 (F).

GUAYAS: Guayaquil, 1790-91, *Haenke* (Prague, type). Near Balao, Jan. 1892, *Eggers* 14277 (Berlin, Macbride photo No. 11518; US). On tree, Teresita, 3 km. west of Bucay, alt. 270 m., July 5-7, 1923, *Hitchcock* 20407 (US). On tree in tropical "cacao" region, Naranjal, alt. 20 m., 1925, *Mille* 35 (F, NY).

GUAYAS, CAÑAR, CHIMBORAZO, and BOLÍVAR junction: Epiphyte, foothills of the western cordillera near Bucay, alt. 300-375 m., June 8-15, 1945, *Camp* E-3676 (US).

35. *Tillandsia* (Phytarrhiza) *scaligera* Mez & Sodiro, Bull. Herb. Boiss. II. 5: 107. 1905. FIGURE 73

Stemless, 33 cm. to nearly 50 cm. high; leaves 20-40 in a sub-fasciculate rosette, 25-30 cm. long, densely and minutely pale-appressed-lepidote throughout; sheaths distinct, elliptic, 4 cm. long; blades linear-triangular, long-acuminate, 10-12 mm. wide, chartaceous when dry; scape erect, slender, shorter than to barely exceeding the leaves, glabrous; scape-bracts exceeding the internodes, elliptic, acute, the lower ones with foliaceous blades, the upper apiculate, nerved; inflorescence simple, lax, linear, many-flowered, 13-18 cm. long,

3.5–4 cm. wide; rhachis wholly exposed by the bracts, straight and not at all geniculate, angled with decurrent lines from the bracts, slightly thickened at the insertion of the flowers, glabrous, internodes

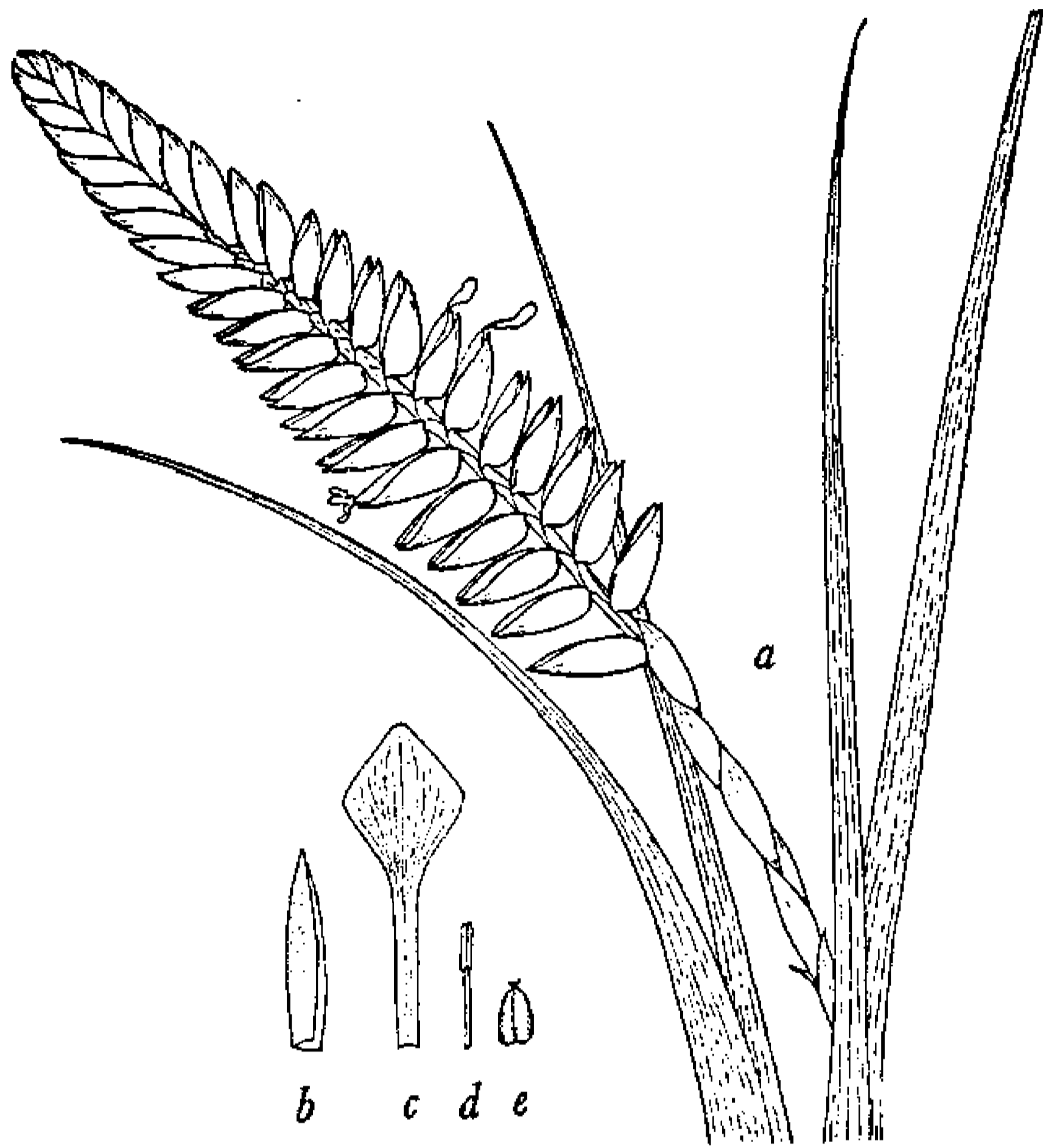


FIGURE 73.—*Tillandsia scaligera*: *a*, Upper part of habit, $\times 1/2$; *b*, sepal, $\times 1$; *c*, petal, $\times 1$; *d*, stamen, $\times 1$; *e*, pistil, $\times 1$.

ca. 5 mm. long; floral bracts spreading, triangular-ovate, 18–19 mm. long, equaling or slightly shorter than the sepals, carinate, faintly nerved, lepidote toward the apex, becoming glabrous; flowers fragrant, appearing sessile because the short pedicel continues the lines of the sepals; sepals free, elliptic, acute, rigid, faintly nerved, nearly glabrous outside, subdensely brown-lepidote inside, the posterior ones sharply carinate; petals white, the blade rhombic, broadly acute, 11 mm. long; stamens deeply included, much exceeding the pistil; capsule fusiform-cylindric, very slender, 40–45 mm. long.

TYPE LOCALITY: "Ecuador, in silvis tropicis secus flumen Pilateu." Type collected by Sodiro (No. 171/4).

DISTRIBUTION: Ecuador.

ECUADOR:

PICHINCHA: Río Pilatón, alt. 800 m., Sept., Sodiro 171/4 (Berlin, type).

LOJA: Epiphytic in "hojarasca" forest, Torata (road to Santa Rosa), alt. ca. 60–80 m., Dec. 26, 1946, R. Espinosa E-1176 (GH).

I started to make the Espinosa material a new species on the basis of its having internodes only half as long as the 10-mm. given in the

original description of *Tillandsia scaligera*. However, the description also says that the inflorescence is distichous, 38-flowered and 18 cm. long, all of which is impossible in combination with a 10-mm. internode but very good with one of 5 mm. Apparently two internodes were measured for one on the type. The remaining discrepancies of indument and dimensions are easily discounted by the fact that the type is in fruit, while the Espinosa material has matured only about half of its flowers.

36. *Tillandsia* (? *Phytarrhiza*) *cornuta* Mez & Sodiro, Bull. Herb. Boiss. II. 5: 106. 1905. FIGURE 74

Stem short, rhizomatose, flowering plant ca. 4 dm. high; leaves fasciculate-rosulate, about 10, 6 dm. long, densely appressed-lepidote throughout, slightly canescent when dry; sheaths elongate, indistinct; blades 15 mm. wide at the base, filiform-acuminate; scape erect, rather stout, much shorter than the leaves, glabrous; scape-bracts all exceeding the internodes, the lower bearing long subfiliform reflexed blades, the upper abruptly acute, rigid, sublustrous; inflorescence simple, linear, 12–17-flowered, 10–12 cm. long, 28 mm. wide, lax; rhachis scarcely thickened at the insertion of the flowers, angled with 4 decurrent lines from the bases of the bracts, glabrous, slightly geniculate toward the base, internodes 6–9 mm. long; floral bracts divergent but not at all imbricate or concealing the rhachis, broadly ovate, apiculate, ca. 18–22 mm. long, slightly shorter than the sepals in fruit, ecarinate, rigid, even or slightly nerved toward the apex; flowers sessile; sepals slightly connate posteriorly, obtuse, rigid, even, glabrous; petals white (! Foster); capsule subcylindric, very slender, 55–60 mm. long.

TYPE LOCALITY: Near Balsapamba, Ecuador. Type collected by Sodiro (No. 171/42).

DISTRIBUTION: Ecuador.

ECUADOR:

ESMERALDAS: Dense moist jungle, Quito–Santo Domingo road, alt. 600 m., Dec. 9, 1948, *Foster* 2636 (US).

BOLÍVAR: In tropical forest, near Balsapamba, Oct., *Sodiro* 171/42 (Berlin, type).

The Foster specimen agrees quite well with the description of the type except that the floral bracts slightly exceed the sepals but this discrepancy may well be due to the difference in age. The Foster plant is just beginning to flower, the type is in fruit.

37. *Vriesia* (*Xiphion*) *goniorachis* (Baker) Mez in Mart. Fl. Bras. 3: 545. 1894. FIGURE 74

Tillandsia goniorachis Baker, Journ. Bot. Brit. & For. 25: 303. 1887.

Flowering plant up to 7 dm. high; leaves many in a crateriform rosette, 3–4 dm. long, densely appressed-lepidote throughout; sheaths

broadly elliptic, minutely brown-lepidote; blades narrowly triangular, 3 cm. wide, recurved toward the apex, concolorous, green, cinereous-lepidote; scape curved, stout; scape-bracts erect, the lower foliaceous

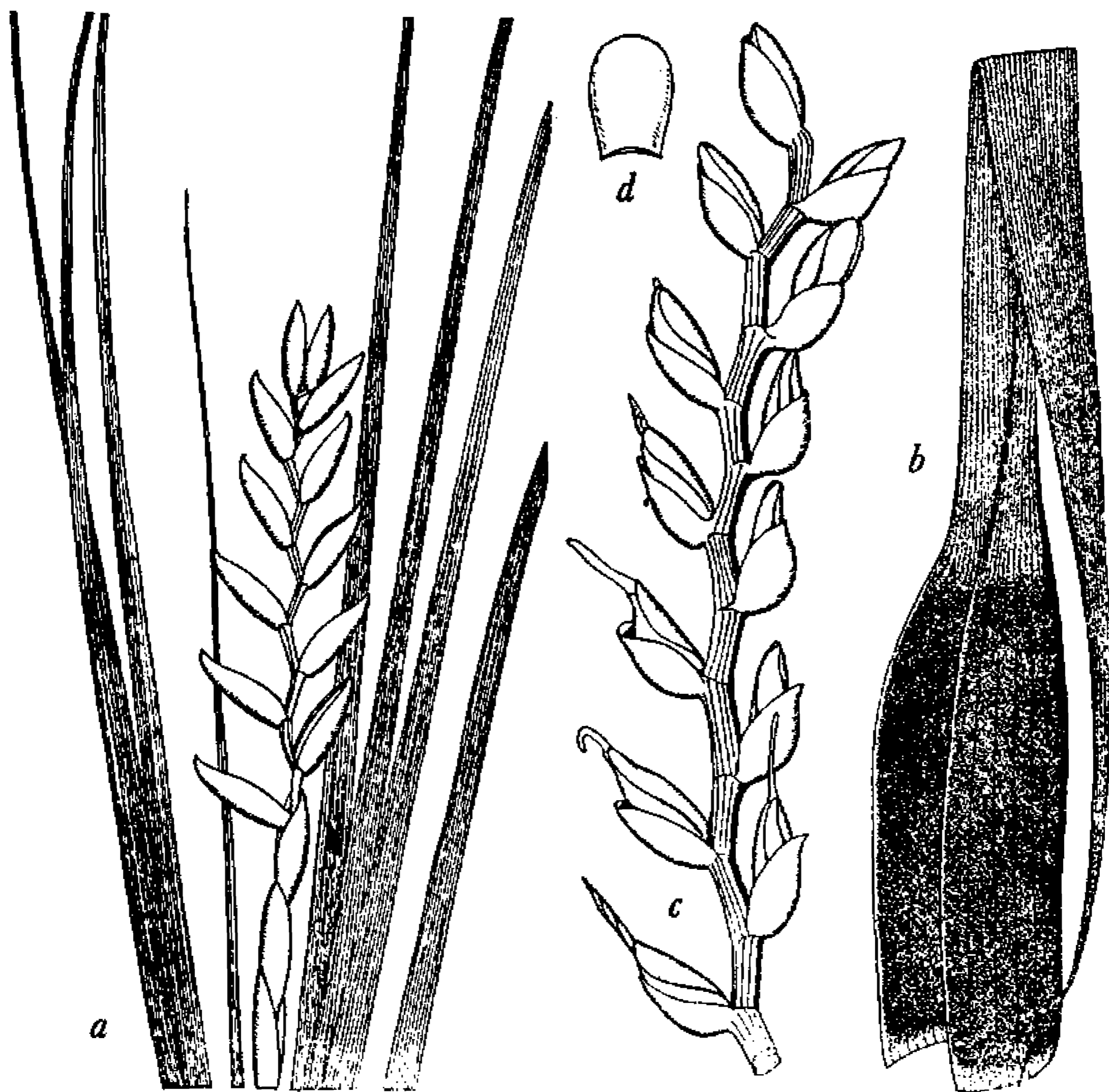


FIGURE 74.—*Tillandsia cornuta*: a, Upper part of habit, $\times 1/2$. *Vriesia goniorachis*: b, Leaf, $\times 1/2$; c, inflorescence, $\times 1/2$; d, sepal, $\times 1/2$.

and densely imbricate, the upper vaginiform, acute or obtuse, equaling or slightly shorter than the internodes; inflorescence simple, lax, many-flowered, linear, 30 cm. long, 4 cm. wide; rachis stout, geniculate; floral bracts suborbicular, obtuse, 2 cm. long, much shorter than the sepals, scarcely carinate, fleshy-coriaceous; flowers divergent, not at all secund; pedicels obconic, very stout, 5 mm. long; sepals broadly elliptic, truncate-obtuse, 22 mm. long, 15 mm. wide, carinate; petals greenish yellow, almost 4 cm. long, bearing two large acuminate scales.

TYPE LOCALITY: "South Brazil." Lectotype collected by Glaziou (No. 15471).

DISTRIBUTION: Vicinity of Rio de Janeiro, Brazil.

BRAZIL:

FEDERAL DISTRICT (?): Pedra do Ilheu, Andarahy Grande, near Rio de Janeiro, Sept. 1884, Glaziou 15471 (K, lectotype; GH, P, Copenhagen, Macbride photo No. 22335).

Mez cites also *Glaziou* 16462 from Pão d'Assucar and *Ule* s. n. from Tijuca, both in the city of Rio de Janeiro.

38. *Vriesia* (? *Vriesia*) *jimenezii* Mez & Tonduz, Repert. Sp. Nov. Fedde 14: 246. 1916.

Flowering plant barely over 4 dm. high, slender; leaves subtriculate, up to 4 dm. long, barely 20 mm. wide, the sheaths and the lower part of the blades dorsally marked with transverse brown bands, acuminate, the apex produced into a mucro 10 mm. long but not pungent; scape erect, less than half as long as the leaves; scape-bracts with a mucronate blade like the leaves, exceeding the internodes; inflorescence lanceolate, acute at both ends, 70 mm. long, 18 mm. wide, compressed, 3-flowered; floral bracts barely imbricate, ovate, acuminate, 45 mm. long, much exceeding the sepals, mucronate, slightly incurved, strongly carinate, glabrous; flowers erect, imperfectly known; sepals elliptic, broadly acute, 30 mm. long, 11 mm. wide, coriaceous, free.

TYPE LOCALITY: Near San Ramón, Costa Rica. Type collected by Tonduz (No. 17899 in hb. Inst. Phys.-geogr. Costar.).

DISTRIBUTION: Known only from the type.

COSTA RICA:

CARTAGO (?): Forests of Tremendal, near San Ramón, alt. 1,300–1,400 m., May, Tonduz in hb. Inst. Phys.-geogr. Costar. 17899 (Berlin, type).

39. *Vriesia* (*Vriesia*) *barclayana* (Baker) L. B. Smith, comb. nov.

FIGURE 75

Tillandsia barclayana Baker, Journ. Bot. Brit. & For. 25: 239. 1887.

Tillandsia lateritia André, Enum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60: 566. Dec. 16, 1888.

Stemless, about 5 dm. high; leaves about 15 in a utriculate rosette, 4–5 dm. long, densely and minutely appressed-lepidote; sheaths large, elliptic, distinct from the blades, brown; blades linear-triangular, acuminate, 15 mm. wide at the base; scape erect, stout; scape-bracts erect, densely imbricate, elliptic, lepidote, even, the lower laminate, the upper acute or obtuse; inflorescence simple, lance-ovate to oblong, complanate, dense, 12–16-flowered, 10–30 cm. long, 35 mm. wide; rhachis straight, broadly winged and enfolding the bases of the flowers, densely lepidote; floral bracts imbricate, obovate, triangular-acute, 3–4 cm. long, equaling or exceeding the sepals, convex, obscurely carinate, coriaceous, lepidote toward the apex; flowers short-pedicellate; sepals free, elliptic, acute or apiculate, 18–21 mm. long, coriaceous, even, glabrous or somewhat lepidote toward the base; petals slightly shorter than the stamens, violet, bearing two large scales; capsule ca. 3 cm. long.

ILLUSTRATIONS: Brom. Andr. pl. 21.

TYPE LOCALITY: Valdivia, Guayas, Ecuador. Type collected by Barclay (No. 622).

DISTRIBUTION: Southern Ecuador.

ECUADOR:

GUAYAS: Woods of Valdivia, 1836, *Barclay* 622 (BM, type). Epiphytic, Balao, Mar. 1892, *Eggers* 14582 (M).

EL ORO: On tree, dry hill, Portovelo (gold mine near Zaruma), alt. 600–1,000 m., Aug. 30–Sept. 1, 1923, *Hitchcock* 21247 (GH, US). On trees by the river, Río Calera (Zaruma), alt. ca. 820 m., Aug. 21, 1947, *R. Espinosa* E 1840 (US).

Los Ríos: Epiphytic, in tropical zone, Sabanetas, July 1876, *André* 4057 (K, type of *Tillandsia lateritia* André).

CHIMBORAZO: On rock, cañon of Río Chanchan, from Naranjapata to below Huigra, alt. 600–900 m., June 19, 1945, *Camp* E-3899 (US).

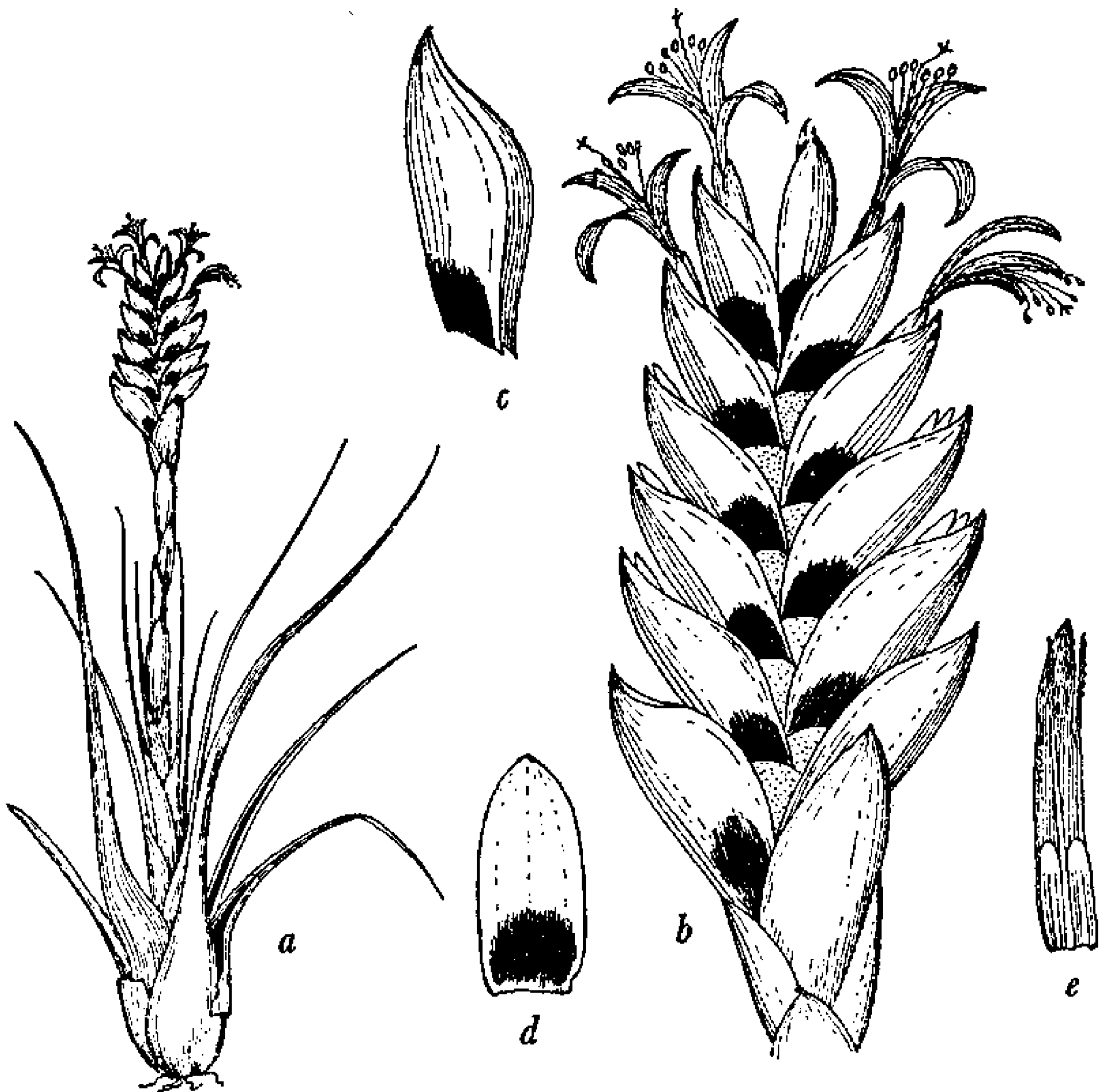


FIGURE 75.—*Vriesia barclayana*: *a*, Habit, $\times 1/4$; *b*, inflorescence, $\times 1$; *c*, floral bract, $\times 1$, after André, Brom. Andr.; *d*, sepal, $\times 1$ *e*, petal and filaments, $\times 1$.

André says that the petals are shorter than the stamens and Mez that they are longer, but André would appear to be correct. The Hitchcock collection shows large scales on the petals indicating that the species belongs in *Vriesia*.

40. *Vriesia* (*Xiphion*) **chontalensis** (Baker) L. B. Smith, comb. nov. FIGURE 76

Tillandsia chontalensis Baker, Journ. Bot. Brit. & For. 25: 237. 1887.

Tillandsia spuria Mez & Wercklé, Repert. Sp. Nov. Fedde 16: 74. 1919.

Stemless, less than 2 dm. high; leaves densely rosulate, 12–14 cm. long, densely appressed-lepidote throughout; sheaths suborbicular, 25 mm. wide, castaneous-lepidote, often forming a subglobose rosette; blades erect, linear-triangular, 10–12 mm. broad at the base, acuminate,

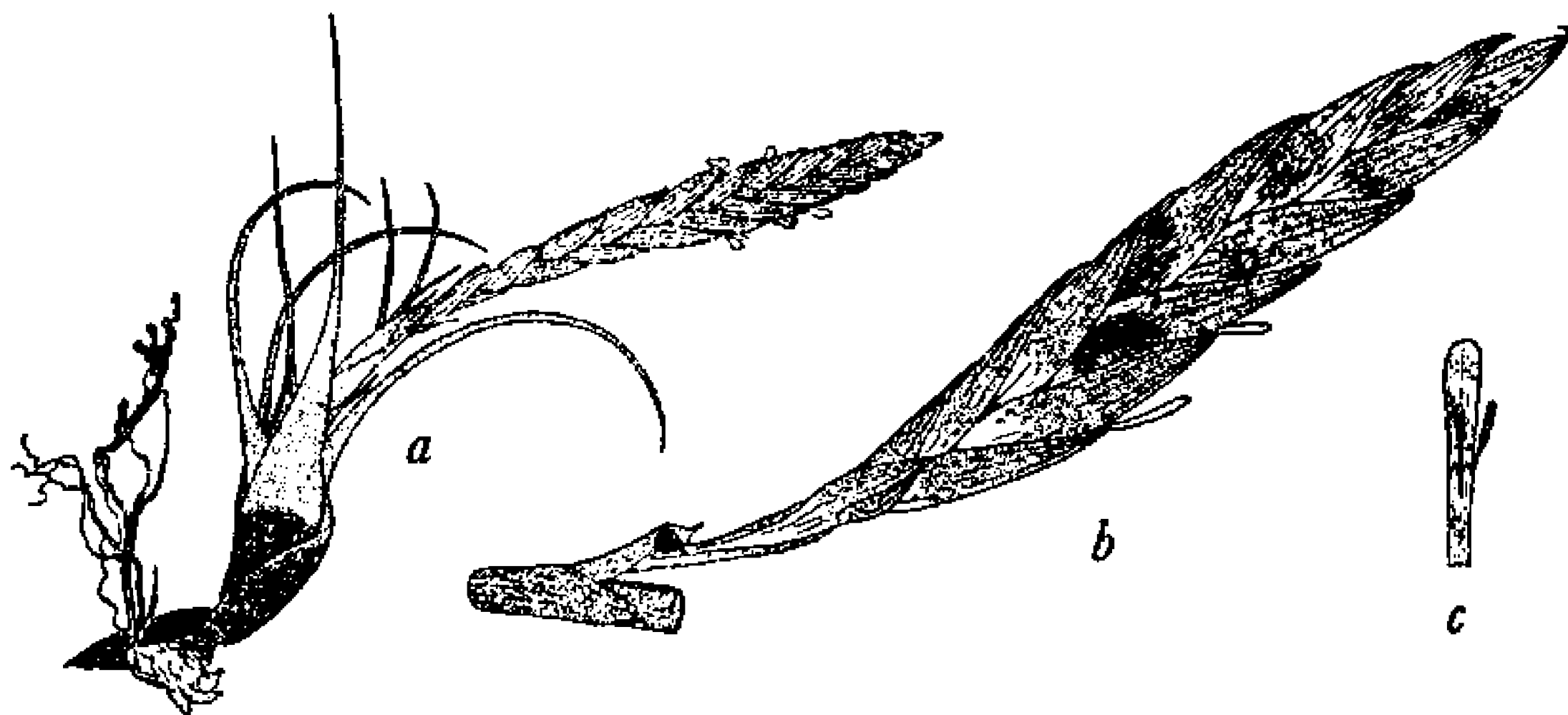


FIGURE 76.—*Vriesia chontalensis*: *a*, Habit (type specimen, with only a few inner leaves remaining), $\times 1/2$; *b*, lateral branch of compound inflorescence, $\times 1$; *c*, petal and stamens, $\times 1$.

involute, rigid when dry, cinereous-lepidote; scape erect or ascending, distinctly shorter than the leaves; scape-bracts densely imbricate, making the scape appear 5 mm. thick, broadly ovate, caudate, roseate, densely appressed-lepidote; inflorescence simple or digitate with 2–6 spikes; primary bracts like the scape-bracts, inconspicuous; spikes linear-lanceolate with an attenuate base of several sterile bracts, acute, complanate, 4–8 cm. long, 10–12 mm. wide, densely 6–14-flowered; floral bracts suberect, three to four times as long as the internodes but partially exposing the rhachis, triangular-ovate, up to 16 mm. long and 9 mm. wide, equaling or exceeding the sepals, carinate, submembranaceous, prominently nerved, appressed-lepidote, roseate toward the apex; flowers sessile; sepals lanceolate, acute, 10–12 mm. long, subfree, chartaceous, glabrous; petals oblong, subtruncate, 12–18 mm. long, denticulate, pale green, bearing 2 scales with long attached bases and small free apices; stamens and pistil shorter than the petals; capsule barely exerted from the bracts.

ILLUSTRATIONS: Contr. Gray Herb. 89: *pl. 3, figs. 5–7*.

TYPE LOCALITY: Vicinity of Chontales, Department of Chontales, Nicaragua. Type collected by R. Tate (No. 413).

DISTRIBUTION: Nicaragua, Costa Rica, Panama (?), southwestern Colombia.

NICARAGUA:

CHONTALES: Vicinity of Chontales, 1867–68, *R. Tate* 413 (K, type; BM).

COSTA RICA:

SAN JOSÉ: San Jerónimo, alt. 1,500 m., Mar. 1909, *P. Biolley f.* 17369 (US).

On trunks and logs in forest, near El General, alt. 1,220 m., Feb. 1936, *Skutch* 2559 (GH, US).

CARTAGO: Las Cóncevas, *Wercklé* (B, type of *Tillandsia spuria* Mez & Wercklé; GH, US). El Muñeco south of Navarro, alt. ca. 1,400 m., Feb. 8, 9, 1924, *Standley* 33804 (US); alt. 1,400–1,500 m., Mar. 6, 7, 1926, *Standley & Torres* 51781 (US).

PANAMA:

CHIRIQUÍ: Base of Volcano Chiriquí, alt. 1,000 m., *Pfau* (! Mez, apparently on the basis of cultivated material).

COLOMBIA:

EL VALLE: Epiphytic in woods, Piedra de Moler, left bank of the mouth of the Río Digua, west slope of the Cordillera Occidental, alt. 900–1,180 m., Aug. 19–28, 1943, *Cuatrecasas* 15188 (GH).

In the Pflanzenreich, Mez tried to maintain *Tillandsia spuria* as a distinct species by placing it in a separate subgenus from that of *T. chontalensis*. However, he placed it there on the basis of petals and stamens which he did not see, according to his own description, and material of the type collection of *T. spuria* in the U. S. National Herbarium shows the flowers to be not as Mez supposed but identical with those of *T. chontalensis*. Finally the presence of scales on the petals necessitates the transfer of the species to *Vriesia*.

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