

THE BROMELIACEAE OF BOLIVIA

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Originally this paper was prepared as an integral part of Robert C. Foster's *Flora of Bolivia* and although it is no longer possible to so include it, I am continuing that format in order to relate to his work as closely as possible. Reference to the "Catalogue" is to R. C. Foster, A catalogue of the ferns and flowering plants of Bolivia, Contrib. Gray Herb. 184. 1958.

- a. Seeds appendaged; ovary wholly or partly superior; fruit a capsule.
- b. Appendages of the seeds entire, not plumose; ovary often only partly superior; leaves mostly spinose-serrate; plants almost always terrestrial. Subfamily 1. *Pitcairnioideae*.
- c. Filaments not forming a tube; petals free.
 - d. Petals twisted together after anthesis, mostly large (13-80 mm.); plants usually large and coarse; leaf-blades narrowly triangular, never narrowed toward base; ovary nearly or quite superior. 1. *Puya*.
 - d. Petals free after anthesis.
 - e. Ovary wholly superior.
 - f. Petals naked, small (3-9 mm.); plants small (25-100 cm.) and delicate; seeds narrow, caudate-appendaged at each pole. 2. *Fosterella*.
 - f. Petals each bearing a single large scale at base.
 - g. Scape evident, bearing a cambium layer; inflorescence paniculate, perennial; plants shrubby. 3. *Deuterocohnia*.
 - g. Scape lacking; inflorescences one-flowered, at the ends of the branches; plants low and cushion-forming. 4. *Abromeitiella*.
 - e. Ovary partly inferior; flowers large and conspicuous, usually zygomorphic; petals often appendaged; seeds winged or caudate. 5. *Pitcairnia*.
- c. Filaments forming a tube to which the petals are joined by their centers; petals with their margins free, yellow or orange; seeds winged. 6. *Dyckia*.
- b. Appendages of the seeds plumose; ovary nearly or quite superior; leaves always entire; plants chiefly epiphytic. Subfamily 2. *Tillandsioideae*.
- h. Petals free, or if slightly joined then with the corolla-tube deeply included in the calyx; inflorescence of one or more

- distichous-flowered spikes or rarely simple and polystichous or even one-flowered.
- i. Petals naked. 7. *Tillandsia*.
 - i. Petals each bearing two scales on the inner surface near the base. 8. *Vriesea*.
 - h. Petals closely agglutinated and simulating true fusion, the corolla-tube about equaling the calyx or longer; flowers always polystichous. 9. *Guzmania*.
 - a. Seeds always naked; ovary wholly inferior; fruit always baccate, fleshy to coriaceous; leaves usually spinose-serrate; plants often epiphytic. Subfamily 3. *Bromelioideae*.
 - j. Petals naked; inflorescence compound.
 - k. Filaments free from each other; petals free, not fleshy; flowers distichous. 10. *Streptocalyx*.
 - k. Filaments forming a tube to which the fleshy petals are joined along their centers but with their margins free; flowers polystichous. 11. *Bromelia*.
 - j. Petals appendaged.
 - l. Ovaries always remaining distinct; inflorescence compound or simple.
 - m. Petals straight, mostly small; sepals usually mucronate. 12. *Aechmea*.
 - m. Petals recurved in a tight coil at anthesis, large (5-9 cm.); sepals unarmed. 13. *Billbergia*.
 - l. Ovaries fused with each other and with the fleshy bracts to form a syncarp; inflorescence with an apical coma, simple.
 - n. Inflorescence with a small inconspicuous coma, never producing basal shoots; plant propagating by elongate rhizomes; petals bearing vertical folds. 14. *Pseudananas*.
 - n. Inflorescence with a large conspicuous coma, often with basal shoots; rhizome lacking; petals bearing well developed scales. 15. *Ananas*.

1. *Puya* Molina

Perennial, often long-caulescent, simple or branching, coarse, often flowering several meters high. Leaves densely rosulate, the blades narrowly triangular, usually spinose-serrate with coarse teeth. Inflorescence simple or compound, the branches fertile throughout or with the apical half sterile. Flowers showy, regular. Sepals free, shorter than the petals. Petals free, usually spreading at anthesis, twisted together afterwards, naked or rarely with paired vertical folds. Stamens usually included, the filaments free. Ovary superior or nearly so, glabrous, the style slender, elongate. Capsule primarily loculicidal. Seeds broad, alate.

- a. Inflorescence and its branches fertile throughout or nearly so. Subgenus 1. *Pitcairniopsis*.

- b. Ultimate axes of the inflorescence more or less visible; neither the inflorescence nor its branches strobiliform.
- c. Inflorescence compound. *Subkey I.*
- c. Inflorescence simple. *Subkey II.*
- b. Ultimate axes of the inflorescence completely covered; inflorescence or its branches strobilate (sometimes the flowers or the bracts reflexed but the axis still covered).
- d. Inflorescence obviously compound (at least by the lobed outline). *Subkey III.*
- d. Inflorescence simple or pseudosimple with the short branches covered by the primary bracts. *Subkey IV.*
- a. Inflorescence compound with branches sterile in large part toward apex. Subgenus 2. *Puya.*

Subgenus 1. PITCAIRNIOPSIS

Subkey I

- a. Branches of the inflorescence more than twice as long as the primary bracts, divergent to spreading; inflorescence usually broad.
- b. Floral bracts coarsely pectinate-serrate. 1. *P. ultima.*
- b. Floral bracts entire or nearly so.
- c. Sepals sparsely lepidote or glabrous.
- d. Branches at least three times as long as the primary bracts.
- e. Racemes lax throughout, the rhachis wholly visible.
- f. Sepals alate-carinate throughout, even. 2. *P. alata.*
- f. Sepals carinate or alate only at base, strongly sulcate when dry in most cases.
- g. Pedicels soon glabrous.
- h. Floral bracts about equaling the pedicels; pedicels 15-18 mm. long. 3. *P. Hofstenii.*
- h. Floral bracts about half as long as the pedicels.
- i. Primary bracts about equaling the sterile bases of the branches; sepals lanceolate, 21 mm. long. 4. *P. potosina.*
- i. Primary bracts much shorter than the sterile bases of the branches; sepals oblong, 15 mm. long. 5. *P. Trollii.*
- g. Pedicels persistently vestite.
- j. Pedicels 20-25 mm. long; floral bracts oblong-ovate. 6. *P. Rusbyi.*
- j. Pedicels 5-15 mm. long; floral bracts broadly ovate or elliptic.
- k. Sepals alate at base, 25-32 mm. long. 7. *P. cristata.*
- k. Sepals not more than angled at base.
- l. Leaf-blades tomentose beneath with coarse linear spreading scales; sepals 17 mm. long. 8. *P. laxa.*

- l. Leaf-blades with subspreading suborbicular scales beneath; sepals 20-28 mm. long.
 9. *sanctae-crucis*.
- e. Racemes subdense; rhachis only partially exposed at anthesis.
- m. Sepals 17 mm. long, scarcely if at all exceeding the floral bracts; pedicels glabrous. 10. *P. Fiebrigii*.
- m. Sepals 28-40 mm. long; pedicels tomentose-lepidote.
- n. Floral bracts lanceolate, nearly flat. .. 11. *P. Meziana*.
- n. Floral bracts ovate, inflated.
- o. Primary bracts much shorter than the long, sterile bases of the branches; floral bracts much exceeded by the sepals. 12. *P. secunda*.
- o. Primary bracts far exceeding the short, sterile bases of the branches; floral bracts nearly equaling the sepals. 13. *P. stenothyrsa*.
- d. Branches little more than twice as long as the primary bracts.
- p. Floral bracts lanceolate, attenuate. 14. *P. glareosa*.
- p. Floral bracts elliptic, ample, rounded and apiculate.
- q. Pedicels to 25 mm. long. 15. *P. olivacea*.
- q. Pedicels not over 10 mm. long. 13. *P. stenothyrsa*.
- c. Sepals densely and persistently vestite.
- r. Indument ferruginous-stellate with stiff-rayed trichomes.
 16. *P. ferruginea*.
- r. Indument obscurely stellate with soft-rayed trichomes.
- s. Pedicels over 15 mm. long.
- t. Floral bracts drying dark; pedicels stout.
 17. *P. riparia*.
- t. Floral bracts not drying dark; pedicels slender.
- u. Primary bracts about one-fifth as long as the branches; sepals acute, 30 mm. long. 18. *P. alba*.
- u. Primary bracts almost half as long as the branches; sepals obtuse and mucronulate, 35-40 mm. long.
 15. *P. olivacea*.
- s. Pedicels less than 15 mm. long; sepals narrow, acute or attenuate with a narrow blunt apex.
- v. Lateral branches over 30 cm. long; floral bracts broadly elliptic. 19. *P. Pearcei*.
- v. Lateral branches not over 9 cm long; floral bracts ovate.
 20. *P. penduliflora*.
- a. Branches of the inflorescence not more than twice as long as the primary bracts; inflorescence narrow.
- w. Sepals glabrous or with a fine appressed deciduous stellate or lepidote indument.
- x. Leaf-blades 12-30 mm. wide.

- y. Branches spreading to slightly deflexed; inflorescence drying almost black. 21. *P. atra*.
- y. Branches erect or ascending.
 - z. Sepals 12 mm. long, ovate-elliptic. 22. *P. dyckioides*.
 - z. Sepals 26-35 mm. long, narrow.
 - A. Floral bracts attenuate, lanceolate, slightly exceeding the pedicels. 14. *P. glareosa*.
 - A. Floral bracts acute, elliptic, about equaling the sepals. 23. *P. glabrescens*.
- x. Leaf-blades 2-10 mm. wide, covered beneath with pale, narrow, spreading scales; lateral branches few-flowered.
 - B. Pedicels 4-7 mm. long, longer or shorter than the floral bracts; leaf-blades 2-3.5 mm. wide. 24. *P. tuberosa*.
 - B. Pedicels 1 mm. long, the floral bracts 15 mm. long; leaf-blades 10 mm. wide. 25. *P. reducta*.
- w. Sepals densely lanate. 26. *P. mollis*.

Subkey II

- a. Sepals 12-60 mm. long; flowering shoot over 3 dm. high.
 - b. Inflorescence densely and coarsely ferruginous-stellate. 16. *P. ferruginea*.
 - b. Inflorescence white-tomentellous to glabrous.
 - c. Floral bracts laciniate-spinose; sepals nearly 6 cm. long. 27. *P. mirabilis*.
 - c. Floral bracts subspinulose to entire; sepals 25-40 mm. long.
 - d. Sepals 25 mm. long; floral bracts uniform, narrowly lanceolate. 28. *P. Kuntzeana*.
 - d. Sepals 30-40 mm. long; lower floral bracts much larger and ampler than the others. 11. *P. Meziana*.
- a. Sepals 7-11 mm. long; flowering shoot slender, 9-30 cm. high.
 - e. Trichomes of the leaf-blade linear, spreading; flowering shoot 25-30 cm. high. 24. *P. tuberosa*.
 - e. Trichomes of the leaf-blade broad, subspreading; flowering shoot 9 cm. high. 29. *P. minima*.

Subkey III

- a. Sepals glabrous or with fine appressed deciduous stellate or lepidote indument.
 - b. Lateral branches well developed, the flowers not fasciculate.
 - c. Floral bracts much exceeded by the sepals, ovate, inflated. 13. *P. stenothyrsa*.
 - c. Floral bracts nearly equaling to exceeding the sepals.
 - d. Sepals 26 mm. long; floral bracts lustrous black. 21. *P. atra*.
 - d. Sepals 17 mm. long; floral bracts dull, paler. 10. *P. Fiebrigii*.

- b. Lateral branches very short with the flowers fasciculate, but the inflorescence interrupted at base and obviously compound; sepals 11 mm. long. 30. *P. paupera*.
- a. Sepals densely lanate or tomentose, the indument mostly persistent after anthesis.
 - e. Floral bracts much exceeded by the sepals.
 - f. Leaf-blades densely appressed-lepidote beneath; floral bracts broadly ovate, ca. 35 mm. long. 26. *P. mollis*.
 - f. Leaf-blades soon wholly glabrous; floral bracts elliptic-oblong, to 55 mm. long. 31. *P. valida*.
 - e. Floral bracts exceeding the sepals.
 - g. Sepals 45 mm. long, narrowly lanceolate or linear; racemes secund. 32. *P. lasiopoda*.
 - g. Sepals 20-30 mm. long; racemes not secund.
 - h. Branches ellipsoid, to 17 cm. long; pedicels 15 mm. long; sepals 30 mm. long. 33. *P. Ugentiana*.
 - h. Branches globose, 6 cm. long; pedicels 7 mm. long; sepals 20 mm. long. 34. *P. ctenorhyncha*.

Subkey IV

- a. Outer bracts (the primary bracts or in a simple inflorescence the floral bracts) conspicuously serrate.
 - b. Apices of the thin outer bracts reflexed; inflorescence densely brown-lanate. 35. *P. Fosteriana*.
 - b. Apices of the outer bracts erect; sepals soon glabrous and contrasting with the densely vestite pedicels. 23. *P. glabrescens*.
- a. Outer bracts entire or very obscurely serrulate.
 - c. Apical part of each outer bract reflexed.
 - d. Inflorescence compound; flowers fasciculate.
 - e. Sepals 17-18 mm. long.
 - f. Inflorescence 8 cm. in diameter; outer bracts 7 cm. long. 36. *P. tristis*.
 - f. Inflorescence 3 cm. in diameter; outer bracts 5 cm. long. 37. *P. leptostachya*.
 - e. Sepals 25-30 mm. long.
 - g. Bracts all membranaceous and subhyaline, soon shattered; leaf-blades nearly glabrous. 38. *P. Cardenasii*.
 - g. Bracts firmer, persistent; leaf-blades densely and conspicuously appressed-lepidote beneath. 39. *P. Herzogii*.
 - d. Inflorescence simple.
 - h. Floral bracts narrow, leaving much of the flower exposed (juvenile); sepals 25 mm. long. 28. *P. Kuntzeana*.
 - h. Floral bracts ample; sepals 14 mm. long. 40. *P. tunarensis*.
 - c. Apical part of each outer bract erect.
 - i. Inflorescence compound with the flowers fasciculate.

- j. Scape well developed; axis of the inflorescence elongate; sepals 11 mm. long. 30. *P. paupera*.
- j. Scape very short, completely hidden; inflorescence capitiform with all the axes aborted; sepals 35-40 mm. long. 41. *P. nana*.
- i. Inflorescence simple.
 - k. Sepals thinly vestite to glabrous.
 - l. Sepals 12-13 mm. long. 42. *P. humilis*.
 - l. Sepals 25 mm. long. 28. *P. Kuntzeana*.
 - k. Sepals densely lanate, 22 mm. long. 43. *P. Brittoniana*.

Subgenus 2. PUYA

- a. Caudex branching and continuing to live after the fruition and death of the flowering shoot; sepals 18 mm. long, exceeding the floral bracts. 44. *P. Weddelliana*.
- a. Caudex simple and columnar, dying after the fruition of the flowering shoot; sepals 40 mm. long, exceeded by the floral bracts. 45. *P. Raimondii*.

1. ***Puya ultima*** L. B. Smith in Contrib. U. S. Nat. Herb. **29**: 540, fig. 94 (1954). To 1.5 m. high. Leaf-blades 6 cm. wide, covered beneath with white, appressed scales, becoming wholly glabrous, the spines ascending, 10 mm. long, broad, black. Inflorescence bipinnate, ample, very lax, glabrous after anthesis. Primary bracts broadly ovate, acuminate, 5 cm. long, about equaling the sterile, naked bases of the branches, pectinate-serrate, subchartaceous. Branches spreading, slender, 5 dm. long, lax. Floral bracts ovate, acuminate, 2 cm. long, equaling or exceeding the slender pedicels, pectinate-serrate. Flowers ascending. Sepals narrowly triangular, strongly carinate, 40 mm. long. LA PAZ: SUR YUNGAS: La Paz to Irupana, 1500 m., *M. B. Foster* 2575 (US; type).

2. ***P. alata*** L. B. Smith in Phytologia, **7**: 422, t. 2, fig. 3, 4 (1961). *P. spathacea* of Catalogue Leaf-blades over 7 dm. long, 3 cm. wide, glabrous above, densely vestite beneath and on the margins with pale, subappressed scales, the spines lax, flat, antrorse, 10 mm. long. Inflorescence compound. Primary bracts elliptic, apiculate, 2 cm. long, shorter than the sterile base of the branch, entire, sparsely and minutely lepidote with linear white trichomes. Branches slightly flexuous, 3 dm. long, 3 mm. in diameter, very lax, angled, soon glabrous; floral bracts like the primary bracts, erect, much exceeding the pedicels. Pedicels slender, to 10 mm. long, sparsely pale-lepidote. Flowers pendent-secund. Sepals lanceolate, rounded and apiculate, 26 mm. long, even, soon glabrous, alate-carinate. POTOSÍ: LINARES: Lagunillas, 1000 m., *Cárdenas* 2851 (F; type).

3. ***P. Hofstenii*** Mez in Fedde, Rep. Nov. Spec. **3**: 8 (1906). *P. Hauthalii* Mez in Fedde, Rep. Spec. Nov. **16**: 65 (1919). Over 1 m. high. Leaf-blades 5 dm. long, 5 cm. wide, densely cinereous-lepidote,

especially beneath, the spines antrorse, 5 mm. long. Inflorescence laxly bipinnate, 3-7 dm. long, glabrous. Primary bracts ovate, acute, about equaling the sterile bases of the branches, inflated, entire, stramineous. Branches spreading to suberect, to 20 cm. long, lax. Floral bracts ovate-elliptic, about equaling the slender, 15-18 mm. long pedicels. Flowers suberect to deflexed. Sepals lanceolate, rounded and apiculate, 26 mm. long. Petals 40 mm. long, naked or appendaged. POTOSÍ: NOR CHICHAS: Tala Chorolque near Guadalupe, *Hauthal* 101 (B; type of *Puya Hauthalii* Mez); Quechisla, 3500 m., *Cárdenas* 339. Argentina.

4. *P. potosina* L. B. Smith in *Phytologia*, 7: 423, t. 2, fig. 7, 8 (1961). Leaf-blades over 5 dm. long, 25 mm. wide, densely vestite with pale, appressed scales but becoming glabrous above, the spines antrorse, 3 mm. long, brown. Scape 8 mm. in diameter at apex, glabrous. Scape-bracts small and exposing most of the upper scape, the ovate, serrulate base 2 cm. long, the slender, linear blade over 5 cm. long. Inflorescence laxly bipinnate, 7 dm. long, glabrous, somewhat glaucous. Primary bracts like the upper scape-bracts but with much shorter blades or merely apiculate, about equaling the sterile bases of the branches. Branches suberect, nearly straight, to 25 cm. long, 4 mm. wide at the flattened base, lax. Floral bracts ovate, apiculate, to 15 mm. long, entire, thin. Pedicels slender, enlarged upward, to 30 mm. long. Flowers more or less secund, often subverticillate. Sepals lanceolate, rounded and apiculate, 21 mm. long, carinate at base, sulcate when dry. Petals 4 cm. long, naked. POTOSÍ: NOR CHICHAS: Quechisla, 3400 m., *Cárdenas* 3738 (US; type).

5. *P. Trollii* L. B. Smith in *Phytologia* 16: 461, t. 1, fig. 10, 11 (1968). Leaves over 7 dm. long; blades ca. 2 cm. wide, covered with pale appressed scales beneath, laxly serrate with dark antrorse spines 2 mm. long. Scape unknown. Inflorescence amply bipinnate, lax, soon glabrous, the fine white stellate trichomes uniform and completely deciduous. Primary bracts ovate, acuminate, much shorter than the sterile bases of the branches. Branches subspreading, to 26 cm. long, laxly flowered. Floral bracts broadly ovate, apiculate, mostly about half as long as the pedicels, thin, nerved, entire. Pedicels slender but strongly enlarged upward, to 20 mm. long. Flowers spreading. Sepals oblong, rounded, 15 mm. long, carinate toward base, sulcate when dry. Petals ca. 3 cm. long. POTOSÍ: Montecanto, *Troll* 661 (M; type).

6. *P. Rusbyi* (Baker) Mez in DC. Monog. Phan. 9: 482 (1896). Flowering over 1 m. high. Leaf-blades over 35 cm. long, 25 mm. wide, covered with appressed white scales on both sides, becoming glabrous. Inflorescence amply bipinnate, covered with fine, white, stellate scales. Primary bracts many times shorter than the branches. Branches lax, 20-30 cm. long. Pedicels subspreading, slender, 20-25

mm. long, persistently vestite. Sepals lance-oblong, apiculate, 20-25 mm. long, more or less alate at base. Petals 4 cm. long, green and deep purple. Stamens exserted. LA PAZ: MURILLO: La Paz, 3000 m., *Rusby* 2846 (NY; type); *Balls* 5900 (F, US); San Jorge, 3600 m., *West* 6402 (UC).

7. *P. cristata* L. B. Smith in *Lilloa*, 14: 95, fig. 7, 8 (1948). Flowering 1-1.5 m. high. Leaf-blades 7 dm. long, covered beneath with appressed, white scales, the spines antrorse, 12 mm. long, brown. Inflorescence compound, minutely white-flocculose. Primary bracts ovate, acuminate, about a third as long as the axillary branches, serrulate. Racemes lax, to 14 cm. long, the naked sterile base to 35 mm. long. Floral bracts acuminate from a broadly ovate base, exceeding the pedicels, subchartaceous when dry, very minutely serrulate. Flowers divergent, not secund. Pedicels slender, 10-15 mm. long, 3-angled at apex. Sepals ovate-lanceolate, acuminate, 25-32 mm. long, strongly crested at base, nerved when dry. Petals 4 cm. long, green. COCHABAMBA: AYOPAYA: Sailapata, 3000 m., *Cárdenas* 3311 (GH; type).

8. *P. laxa* L. B. Smith in *Phytologia*, 6: 195, t. 1, fig. 7, 8 (1958). Flowering 8 dm. high. Leaf-blades 27 cm. long, caudate-acuminate with a long entire apex, densely tomentose with coarse white scales especially beneath, the spines antrorse, slender, 5 mm. long, brown. Scape 4 mm. in diameter, soon glabrous. Scape-bracts ovate, thin, the lower with small foliaceous blades, the upper merely acuminate, entire, much shorter than the internodes. Inflorescence laxly bipinnate, soon glabrous except for the white-puberulent pedicels. Primary bracts broadly ovate, apiculate, entire, to 25 mm. long, thin, mostly about half as long as the sterile bases of the branches. Branches spreading, straight, very slender, lax, the lateral to 23 cm. long. Floral bracts broadly ovate, apiculate, to 13 mm. long, slightly exceeding the slender pedicels, entire, membranaceous. Flowers not secund. Sepals lance-oblong, apiculate, 17 mm. long, thin, sulcate, slightly carinate at base. Petals 3 cm. long, violet. SANTA CRUZ: VALLE GRANDE: Pulquina, 1500 m., *Cárdenas* 5092 (US; type).

9. *P. sanctae-crucis* (Baker) L. B. Smith in *Proc. Amer. Acad.* 70: 154 (1935). *Pitcairnia robusta* *Rusby* in *Bull. N. Y. Bot. Gard.* 6: 488 (1910). Densely aggregated, flowering 1-2 m. high. Leaf-blades to 35 mm. wide, glabrous above, covered beneath with subspreading pale-cinereous scales, the spines mostly antrorse, 10 mm. long, broad, black. Scape stout, white-tomentose-lepidote, becoming glabrous. Scape-bracts erect, imbricate, subfoliaceous. Inflorescence amply bipinnate, lax, dark red except the petals, white-tomentose-lepidote, soon becoming glabrous. Primary bracts ovate, acuminate to apiculate, from about half as long as the naked sterile bases of the lower branches to slightly exceeding those of the upper ones, serrulate. Branches divergent, 14-30 cm. long, subdense. Floral bracts ovate,

apiculate, 15-22 mm. long, thin-coriaceous, often obscurely denticulate. Flowers suberect, more or less secund. Pedicels 5-10 mm. long, rather slender. Sepals lanceolate, acute, 20-28 mm. long, exceeding the floral bracts, sulcate when dry, the posterior ones obscurely carinate. Petals 4 cm. long, dark violet. BOLIVIA: *Castelnau* s. n. P; type); LA PAZ: MURILLO: Songo, *Bang* 892 (B, F, G, GH, M, MO, NY, US); CAUPOLICÁN: Apolo, *R. S. Williams* 2655 (NY; type of *Pitcairnia robusta* Rusby).

10. *P. Fiebrigii* Mez in Fedde, Rep. Spec. Nov. 3: 9 (1906). Leaves unknown. Scape-bracts large, ovate, glabrous, serrate toward apex, the blades narrow, armed with stout, uncinata, castaneous, 4 mm. long spines, densely villous-lepidote beneath. Inflorescence bipinnate, glabrous. Lowest primary bracts like the scape-bracts, the others elliptic, entire, barely exceeding the short sterile bases of the branches. Branches to 23 cm. long, lax at base, dense toward apex. Floral bracts very broadly elliptic, 25 mm. long, nearly or quite equaling the sepals, inflated, entire. Flowers suberect. Pedicels to 15 mm. long, stout, thickened upward. Sepals ovate-elliptic, apiculate, 17 mm. long, subrigid. Petals 25 mm. long. Bolivia: *Fiebrig* 3210 (B; type); 3211.

11. *P. Meziana* Wittm. in Meded. Rijks Herbar. 29: 85 (1916). *Pitcairnia grandiflora* of Catalogue. Flowering to 2.4 m. high. Leaves 45-85 cm. long, the blades 35 mm. wide, soon glabrous above, covered beneath with appressed, cinereous scales, the spines mostly antrorse, 10 mm. long. Inflorescence simple and pyramidal-cylindric or few-branched, finely white-tomentellous, all but the pedicels becoming glabrous, the axis stout. Floral bracts lanceolate, acuminate, pungent, the lowest 9 cm. long, ample, exceeding the sepals, subspinulose, submembranaceous, strongly nerved, the upper much reduced. Pedicels rather slender, to 15 mm. long. Sepals lanceolate, apiculate, 30-40 mm. long. LA PAZ: MURILLO: Miraflores to Obrajillo, 3600 m., *Buchtien* 8531 (US); La Paz, 3600 m., *Foster* 2560 (US); LOAIZA: Teneria, Quimzacruz Cordillera, 3000 m., *Herzog* 2487 (L; type).

12. *P. secunda* L. B. Smith in Phytologia 7: 424, t. 2, fig. 11, 12 (1961). Flowering 1-2 m. high. Leaf-blades 35 mm. wide, glabrous above, covered beneath with coarse, subappressed, whitish scales, the spines antrorse, flat, 10 mm. long. Scape 2 cm. in diameter, densely and finely pale-floccose. Scape-bracts densely imbricate, the lower foliaceous, the upper acuminate from a broadly ovate base, serrulate, red. Inflorescence laxly bipinnate, at first finely white-floccose. Primary bracts like the upper scape-bracts, much shorter than the long sterile bases of the branches. Branches divergent, 15-30 cm. long, subdensely secund-flowered with the slender rhachis covered toward apex. Floral bracts ovate, acuminate, 20-25 mm. long, about equaling

the middle of the sepals, rather thin, red, obscurely serrulate, soon glabrous. Pedicels slender, 5-10 mm. long. Sepals linear-lanceolate, apiculate, 28 mm. long, ecarinate, soon glabrous. Petals dark violet. COCHABAMBA: Yungas, 3000 m., *M. B. Foster* 2550 (US); CHAPARE: Aguirre to Incachaca, 2000 m., *Cárdenas* 4381 (US; type).

13. *P. stenothyrsa* (Baker) Mez in DC. Monog. Phan. **9**: 481 (1896). *Pitcairnia Bangii* Baker in Mem. Torr. Bot. Club, **6**: 124 (1896). Plant to 1.5 m. high. Leaf-blades 40 mm. wide, densely white-lepidote beneath, the spines antrorse, nearly straight, 6 mm. long. Inflorescence amply bipinnate. Primary bracts very broadly ovate, laciniate-spinulose, the lower short-acuminate, the upper broadly acute. Branches to 20 cm. long, bearing 10-20 more or less secund flowers, tomentose-lepidote or glabrate. Floral bracts ovate, acute, 20 mm. long, exceeded by the sepals, entire or minutely serrulate, inflated, red, tomentellous toward base. Pedicels 10 mm. long, rather stout, ferruginous-tomentose. Sepals narrowly elliptic-triangular, rounded and mucronulate, 33 mm. long, 9 mm. wide, sparsely lepidote. Petals 5 cm. long, violet. LA PAZ: LARECAJA: Sorata, 2650-3300 m., *Mandon* 1189 (K; type); *Bang* 1631 (BM; type of *Pitcairnia Bangii* Baker; GH, NY, US); 2700 m., *Cárdenas* 1217 (GH). COCHABAMBA: TOTORA: Incallacta to Totorá, 3800 m., *Cárdenas* 2373 (GH); CAPINOTA: Panduro, Río Caine, *Cárdenas* 3444 (GH); CERCADO: Taquina, 12 km. north of Cochabamba, 2700 m., *Cárdenas & Cutler* 7408 (GH).

14. *P. glareosa* L. B. Smith in Lilloa, **14**: 96 (1948). Plant to 1 m. high. Leaf-blades 5 cm. wide, densely white-lepidote beneath, the spines antrorse, curved, brown. Inflorescence bipinnate, minutely white-flocculose. Primary bracts oblong-ovate, acuminate, to 7 cm. long, a half to a third as long as the axillary branches, subchartaceous when dry, minutely serrulate. Racemes subsessile, suberect to divergent, the rhachis 14-15 cm. long, sulcate. Floral bracts lanceolate, acuminate, slightly exceeding the pedicels, minutely erose, membranaceous. Flowers divergent. Pedicels slender, to 17 mm. long. Sepals narrowly lanceolate, acuminate, 26 mm. long, slightly carinate at base, subcoriaceous. Petals 4 cm. long. LA PAZ: PACAJES: Calacoto, 3600 m., *Cárdenas* 3583 (GH; type).

15. *P. olivacea* Wittm. in Meded. Rijks Herbar. **29**: 83 (1916). To 1.5 m. high. Leaf-blades 3-4 cm. wide, pale-lepidote, becoming glabrous, the spines 5 mm. long, dark, slender. Scape elongate, glabrous. Scape-bracts broadly ovate, soon disintegrating. Inflorescence amply paniculate, lax, olivaceous-glaucous, covered with fine white stellate trichomes when young. Primary bracts suborbicular, apiculate, 4 cm. long, exceeding the short, sterile, naked bases of the branches, serrate, subchartaceous, soon disintegrating. Branches divergent, simple, laxly few-flowered, 10-12 cm. long. Floral bracts elliptic, apiculate, 3 cm. long, equaling or exceeding the slender pedicels, serrulate. Sepals

lanceolate, obtuse and mucronulate, 35-40 mm. long, thickened at base but not carinate. Petals 6-7 cm. long, pale lilac. SANTA CRUZ: CORDILLERA: Quebrada de Charagua, 950 m., *Herzog* 1216 (L; type); Lagunillas, 1050 m., *Cárdenas* 4786 (US); VALLE GRANDE: Valle Grande, 2000 m., *Cárdenas* 5300 (US).

16. *P. ferruginea* (R. & P.) L. B. Smith, *Phytologia* 16: 461 (1968). *Pitcairnia ferruginea* R. & P. *Fl. Peruv.* 3: 36 (1802). *Pitcairnia consimilis* Baker in *Journ. Bot.* 19: 266 (1881). Very variable, flowering to nearly 4 m. high. Stem stout, woody, covered with the remains of dead leaves. Leaf-blades narrowly triangular, attenuate, 5 cm. wide, coarsely spinose-serrate, white-lepidote beneath. Scape stout, rather woody, ferruginous-stellate, then glabrous. Scape-bracts ovate, attenuate, at least the lowest serrate. Inflorescence usually paniculate, laxly pyramidal, covered with ferruginous stellate scales. Primary bracts like the upper scape-bracts, much shorter than the branches and usually not equaling their sterile bases. Branches secundly many-flowered. Floral bracts ovate, acute, entire, usually shorter than the pedicels. Pedicels slender, 1-6 cm. long. Sepals oblong, obtuse, 12-45 mm. long, densely ferruginous-stellate. Petals to 14 cm. long though often much smaller, greenish to various shades of purple, usually with 2 vertical calli near base but varying to completely naked in a single flower. Stamens included. Ovary 2/3 superior. Ovules narrowly winged. Capsule globose, 25 mm. long. LA PAZ: MURILLO: La Paz, 3600 m., *Balls* 5881 (US); 3000 m., *Bang* 152 (BM, GH, US); 3800 m., *Buchtien* s. n. (BM, GH); 810 (US); 3600 m., *Foster* 2561 (US); *Rose* 18854 (US); 3000 m., *Rusby* 2845 (NY); 3450 m., *Williams* 2355 (NY); Cerros de Obrajés, 3600 m., *Cárdenas* 2403 (GH); La Paz to Hacienda Chaco, 1200 m., *Foster* 2577 (US); LARECAJA: Sorata, 2650-3700 m., *Mandon* 1173 (BM, GH, K, S; type no. of *Pitcairnia consimilis* Baker); YUNGAS: 1800 m., *Rusby* 2847 (F, NY, US); Cordillera Real, Nequejahuira, 2400 m., *Tate* 634 (NY). WITHOUT LOCALITY: *Kuntze* s. n. (NY). Ecuador, Peru.

17. *P. riparia* L. B. Smith in *Phytologia*, 7: 424, t. 2, fig. 9, 10 (1961). Flowering about 1.5 m. high. Leaf-blades 2 cm. wide, glabrous above, covered beneath with cinereous scales, the spines lax, slender, pale, uncinata, mostly antrorse, 4-5 mm. long. Scape 2 cm. in diameter, soon glabrous except the nodes. Scape-bracts deciduous, unknown. Inflorescence laxly bipinnate, narrowly pyramidal, 7 dm. long, drying black, densely white-lanate. Primary bracts ovate, acute, ample, much exceeding the short, flat, sterile bases of the branches, thin-coriaceous, becoming glabrous, the margins crisped when dry. Lateral branches few, basal, 10-15 cm. long, lax, their floral bracts shorter than the sepals, the terminal branch elongate with floral bracts the size of the primary bracts and much exceeding the sepals. Pedicels rather stout, 20 mm. long. Flowers more or less

secund. Sepals lance-elliptic, apiculate, 42 mm. long, dull and rather rugose on drying. Petals over 6 cm. long. LA PAZ: MURILLO [?]: Road to Hacienda Chaco, eastern Cordillera, *M. B. Foster* 2578 (US; type).

18. *P. alba* L. B. Smith in *Phytologia*, 5: 49, t. 7, fig. 3-5 (1954). Plant 2 m. high. Leaves unknown. Inflorescence laxly bipinnate, persistently white-flocculose. Primary bracts suborbicular, apiculate, 3 cm. long, densely serrate. Branches divergent, 15 cm. long, subdense with pendent-secund flowers. Floral bracts elliptic, acute, about equaling the pedicels, entire, subcoriaceous. Pedicels slender, to 25 mm. long. Sepals narrowly lanceolate, acute, 30 mm. long, ecarinate. Petals over 5 cm. long, white, bearing 2 long vertical calli near the base. TARIJA: O'CONNOR: Palos Blancos, 800 m., *Cárdenas* 4952-a (US; type).

19. *P. Pearcei* (Baker) Mez in DC. *Monog. Phan.* 9: 480 (1896). Over 1 m. high. Leaf-blades 40 mm. wide, glabrous or sparsely lepidote throughout, the spines antrorse, 10 mm. long. Inflorescence amply bipinnate. Primary bracts narrowly triangular, densely spinulose-serrate, much shorter than the sterile naked bases of the branches. Branches ascending from a suberect to spreading base, over 3 dm. long, flavous-tomentose especially toward apex. Floral bracts broadly elliptic, apiculate, 20 mm. long, entire, membranaceous, glabrous or puberulent. Flowers spreading, more or less secund. Pedicels to 10 mm. long, rather slender, densely short-tomentose. Sepals narrowly lanceolate, apiculate, 32 mm. long, much exceeding the floral bracts, finely appressed-tomentose. Without locality: *Bang* s.n. (GH, NY, type); Milluguaya, 1300 m., *Buchtien* 4287 (US); LARECAJA: Tipuani, US). LA PAZ: NOR YUNGAS: Coroico, 900-1200 m., *Pearce* s. n. (K; 1400 m., *Buchtien* 7179 (US). COCHABAMBA: Puente Villa, 1400 m., *Cárdenas* 3689 (GH, US); Pasorapa, *Cárdenas* 5924 (US).

20. *P. penduliflora* L. B. Smith in *Contrib. Gray Herb.* 98: 12, t. 4, fig. 3, 4 (1932). Flowering 6 dm. or higher. Leaf-blades (on the basis of the lower scape-bracts) glabrous above, sparsely and minutely lepidote beneath, the spines antrorse, castaneous. Scape rather slender, soon glabrous. Scape-bracts ovate, serrulate, submembranaceous, red, the lower with a long blade. Inflorescence few-branched, 25 cm. long, very finely white-tomentose. Primary bracts ovate, acute, much shorter than the branches, serrulate, submembranaceous, red, nerved. Branches laxly few-flowered, briefly sterile at apex, complanate at base, the lateral not over 9 cm. long. Floral bracts like the primary but entire, slightly exceeding the pedicels. Flowers pendulous. Pedicels to 13 mm. long. Sepals narrowly lanceolate, acuminate, 35 mm. long. Petals 45 mm. long, greenish violet when dry. LA PAZ: LARECAJA: Tipuani, 1400 m., *Buchtien* 7182 (US; type).

21. *P. atra* L. B. Smith in Contrib. U. S. Nat. Herb. **29**: 536, fig. 90 (1954). Caulescent with a caudex like that of *Yucca aloifolia*, the flowering shoot over 2 m. high. Leaf-blades 25 mm. wide, soon glabrous, the spines mostly antrorse, 5 mm. long, dark. Scape 2 cm. in diameter, tomentose-lepidote, soon glabrous. Scape-bracts densely imbricate, subfoliaceous, the blades subdensely lepidote above with fine, irregular, white scales. Inflorescence densely but distinctly bipinnate, covered with fine, stellate, ferruginous scales, soon glabrous. Primary bracts broadly ovate, acute, 8 cm. long, even or faintly striate, black, lustrous. Branches spreading to slightly deflexed, ellipsoid, 9-10 cm. long exclusive of the short stout sterile base, 5-6 cm. in diameter. Floral bracts imbricate, very broadly elliptic, obtuse, 4 cm. long, exceeding the sepals, sparsely and very minutely serrulate, subchartaceous, black, lustrous. Pedicels slenderly cylindric, 8 mm. long. Sepals narrowly elliptic, obtuse, 26 mm. long, carinate, lustrous. COCHABAMBA: Above Yungas, 3150 m., *Foster* 2551 (US; type); CARRASCO: Jatun Pino, 3000 m., *Cárdenas* 5285 (US).

22. *P. dyckioides* (Baker) Mez in DC. Monog. Phan. **9**: 486 (1896). Stemless, 4-7 dm. high. Leaf-blades 12-20 mm. wide, glabrous above, covered beneath with pale, appressed scales. The spines antrorse, 3 mm. long, curved. Scape 15 mm. in diameter, furfuraceous at first. Scape-bracts imbricate, broadly ovate, acuminate to a linear blade, densely serrulate. Inflorescence bipinnate, subdensely cylindric, 2-4 dm. long, 5-8 cm. in diameter, the axes furfuraceous when young. Primary bracts like the scape-bracts but more coarsely serrate and the upper bladeless, 45-60 mm. long. Branches erect or divergent, slightly if at all exceeding the primary bracts, subdensely few-flowered. Floral bracts ovate-elliptic, apiculate, nearly or quite equaling the sepals, entire or serrulate, thin, nerved. Pedicels 5-7 mm. long, slender. Sepals ovate-elliptic, 12 mm. long, glabrous, nerved. Petals 20 mm. long, green. CHUQUISACA: TOMINA: *Weddell* 3739 (P; type); Tomabamba, *Weddell* 3881 (P). TARIJA: CERCADO: Tarija, *West* 8323 (UC). Argentina.

23. *P. glabrescens* L. B. Smith in Contrib. U. S. Nat. Herb. **29**: 537, fig. 91 (1954). Flowering 6-8 dm. high. Leaf-blades 2-3 cm. wide, at first covered on both sides with gray appressed scales, the spines slender, curved, 10 mm. long. Scape erect, shorter than the leaves, stout. Inflorescence bipinnate, densely cylindric, densely and finely white-lanate with the bracts and sepals soon becoming glabrous. Primary bracts persistent, elliptic, ample, acute, to 13 cm. long, equaling the branches, opaque, serrate. Floral bracts elliptic, acute, about equaling the sepals, serrulate. Pedicels slender, 16 mm. long. Sepals lance-ovate, acuminate, much thickened centrally but not winged, 35 mm. long, coriaceous. Petals 55 mm. long. COCHABAMBA: TARATA: Llallaguani to Anzaldo, 3000 m., *Cárdenas* 4383 (US); 4384

(US; type); CERCADO: Taquina, 10 km. east of Cochabamba, 2900 m., *Eyerdam* 25311 (UC, US); Tunari, 2850 m., *Foster* 2538 (US); 2539 (US); AYOPAYA: Parangani, 2560 m., *Cárdenas* 4811 (US).

24. *P. tuberosa* Mez in DC. Monog. Phan. 9: 483 (1896). Flowering plant less than 3 dm. high including the very short erect rhizome. Leaf-sheaths forming a globose bulb 3 cm. in diameter, the blades linear, flexuous, filiform-acuminate, 15-18 cm. long, 2-3.5 mm. wide, glabrous above, covered with pale, narrow, spreading scales beneath, the spines spreading or ascending, fine, 1-2 mm. long. Scape slender, white-flocculose, becoming glabrous. Scape-bracts ovate with long, filiform blades, pale-lepidote. Inflorescence simple or with a few short branches at base, cylindric, 7-10 cm. long, white-flocculose at first. Primary bracts ovate, acuminate, 2 cm. long, longer or shorter than the laxly few-flowered branches, minutely serrulate. Floral bracts ovate, acute, thin, red. Pedicels slender, 4-7 mm. long, longer or shorter than the floral bracts. Sepals lance-oblong, acute, 7-9 mm. long. Petals 14 mm. long, blue-violet. Bolivia: "Peru", *Haenke* (M; type); SANTA CRUZ: VALLE GRANDE: Cuesta de Los Monos, 1000 m., *Cárdenas* 4647 (US); El Fuerte to Samaipata, 1800 m., *Cárdenas* 5198 (US).

Note: Haenke was near the two Cárdenas localities and most species of *Puya* have very restricted ranges, so his material probably came from this same general area.

25. *P. reducta* L. B. Smith in Phytologia, 10: 472, t. 1, fig. 1, 2 (1964). Leaf-blades ca. 4 dm. long, glabrous above, subdensely tomentose beneath with white linear trichomes, the spines slender, pale, antrorse, 4 mm. long. Scape erect, ca. 3 mm. in diameter, finely white-stellate. Scape-bracts erect, ovate with a caudate apex, red, the upper ones about equaling the internodes. Inflorescence laxly bipinnate, sparsely white-stellate, becoming glabrous. Primary bracts like the upper scape-bracts but not caudate, nearly the same size and form as the floral bracts, exceeding the axis of the very short few-flowered lateral branches. Branches divergent to spreading with a very short naked sterile base, subdense but with the axis largely exposed. Floral bracts suberect, broadly ovate, acute and apiculate, 15 mm. long, ecarinate, broadly convex, red with a narrow scarious margin, subchartaceous. Pedicels about 1 mm. long but slender and distinct. Sepals linear-lanceolate, narrowly obtuse and apiculate, 27 mm. long. Petals ca. 4 cm. long, naked. LA PAZ: CAUPOLICÁN: Altunkama, 2600 m., *Cárdenas* 5687 (US; type).

26. *P. mollis* Baker ex Mez in DC. Monog. Phan. 9: 488 (1896). Leaf-blades 4 cm. wide, glabrous above, covered beneath with fine, appressed, cinereous scales, the spines antrorse, uncinata, pale brown, 5 mm. long. Scape unknown. Inflorescence compound, dense, stout-cylindric or ellipsoid, densely white-lanate. Primary bracts ovate,

acuminate, some nearly equaling the branches, others about half as long, thick, coriaceous, slightly serrulate toward apex. Branches suberect, to 10 cm. long with a tuft of sterile bracts at apex. Floral bracts straight, broadly ovate, acute, 35 mm. long, much exceeded by the sepals, entire, thick, coriaceous. Pedicels stout, 15 mm. long. Sepals subacute, 28 mm. long, very thick. Petals 6 cm. long, greenish violet. Stamens included. LA PAZ: LARECAJA: Sorata, 2700-3000 m., *Mandon* 1190 (BR, GH, P); *Bang* 1629 (K; type; BM, GH, US).

27. *P. mirabilis* (Mez) L. B. Smith in *Phytologia* 16: 461 (1968). *Pitcairnia mirabilis* Mez in *Fedde, Repert. Spec. Nov.* 3: 6 (1906). Flowering to 1.5 m. high. Leaves persistent, the sheaths broadly ovate, very thick, forming an epigaeous bulb, the blades linear, attenuate, not contracted at base, 10-15 mm. wide, coarsely spinose-serrate, soon glabrous. Scape stout, glabrous. Scape-bracts erect, exceeding the internodes but exposing the scape, broadly ovate, the lower with long spinose blades, the upper with short ones. Inflorescence laxly racemose, cylindric, 3 dm. long, the axis stout, straight. Floral bracts suberect to spreading, broadly ovate-elliptic, attenuate, 30 mm. long, exceeding the pedicels, laciniate-spinose. Pedicels suberect at anthesis, becoming decurved, 12 mm. long. Sepals subtriangular, slightly asymmetric and obscurely mucronulate at apex, nearly 6 cm. long, ecarinate, thick, coriaceous. Petals 95 mm. long, yellow-green, naked. Stamens included. Ovary 3/4 superior. Ovules alate. COCHABAMBA: CERCADO: Cerro San Pedro, Cochabamba, 2560 m., *Cárdenas* 3835 (GH); *Adolfo* 177 (US); QUILLACOLLO: Cerro del Calvario, 2560 m., *Cárdenas* 3578 (GH). TARIJA: ARCE: Bermejo, 1400 m., *Fiebrig* 2320 (B; type); O'CONNOR: Chuquiaca, *Fiebrig* 2420a (B). Argentina.

28. *P. Kuntzeana* Mez in *DC. Monog. Phan.* 9: 490 (1896). Flowering over 1 m. high. Leaves unknown. Scape stout, densely white-tomentose when young, becoming glabrous. Scape-bracts (upper) reflexed, lance-triangular, ca. 15 cm. long, sparsely laciniate-spinulose. Inflorescence simple, densely cylindric, subacute, 30 cm. long, ca. 7 cm. in diameter, densely tomentulose when young, becoming glabrous. Floral bracts narrowly lanceolate, equaling or exceeding the sepals, entire, submembranaceous, the lowest reflexed, the others erect or suberect. Flowers erect or suberect. Pedicels slender, to 12 mm. long. Sepals subelliptic, triangular-acute, 25 mm. long, 8 mm. wide. Petals obtuse, 46 mm. long, brownish. Stamens exerted. COCHABAMBA: CERCADO: Tunari, 1300 m., *Kuntze* s. n. (NY; type).

29. *P. minima* L. B. Smith in *Phytologia* 7: 423, t. 2, fig. 5, 6 (1961). Flowering only 10 cm. high. Leaves forming a subbulbous rosette, to 12 cm. long, the blades 6 mm. wide, covered on both sides with suborbicular, slightly spreading, cinereous scales, becoming glabrous above, the spines retrorse, 1.5 mm. long, yellow-brown. Scape slender, stellate-lepidote, mostly hidden by the leaves. Scape-bracts imbricate,

the upper ovate, acute, thin. Inflorescence simple, 4 cm. long, subdense, few-flowered, sparsely stellate-lepidote. Floral bracts like the upper scape-bracts, to 13 mm. long, much exceeding the pedicels, bright red. Pedicels slender, 8 mm. long. Sepals oblong, broadly acute and apiculate, 11 mm. long. Petals 15 mm. long. TARIJA: MENDEZ: Sama, 2500 m., *West* 8345 (UC; type).

30. *P. paupera* Mez in Fedde, Repert. Spec. Nov. 3: 14 (1906). Stemless, flowering 22 cm. high. Leaf-blades 7 mm. wide, velutinous-lepidote especially beneath, the spines dense, slender, 3 mm. long. Scape slightly exceeding the leaves, densely velutinous. Scape-bracts erect, exceeding the internodes, sublanceolate, bladeless, subglabrous, minutely spinose. Inflorescence subsimple, rather densely cylindric, slightly or not interrupted at base, 10 cm. long, 15 mm. in diameter. Branches basal with one normal and one abortive flower, shorter than the bracts. Floral bracts ovate, acuminate, 20 mm. long, denticulate, glabrous, nerved. Flowers erect. Pedicels 6 mm. long. Sepals oblong, obtuse, 11 mm. long, minutely araneose. Petals 15 mm. long, blue or violet. TARIJA: CERCADO: Tucumilla, 2600 m., *Fiebrig* 2005 (B; type).

31. *P. valida* L. B. Smith in Phytologia, 10: 474, t. 1, fig. 3, 4 (1964). Flowering 3 m. high. Leaf-blades 4 cm. wide, soon wholly glabrous, laxly serrate with brown stiffly antrorse brown spines 3 mm. long. Scape erect, over 4 cm. in diameter (! photo). Scape-bracts early deciduous, unknown. Inflorescence subdensely bipinnate, over 1 m. long, except for the petals and genitalia covered with a fine white dense appressed tomentum. Primary bracts small and inconspicuous (! photo). Branches subspreading, strobilate, nearly 3 dm. long, 7 cm. in diameter. Floral bracts elliptic-oblong, acute and apiculate, to 55 mm. long, distinctly exceeded by the sepals, coriaceous, rigid, very minutely serrate toward apex. Flowers suberect. Pedicels subcylindric, 2 cm. long, 5 mm. in diameter. Sepals lance-elliptic, rounded and apiculate, 35 mm. long, coriaceous when dry, ecarinate. Petals naked, twisted together after anthesis. CHUQUISACA: CAMPERO: Río Chico, 2500 m., *Cárdenas* 6012 (US; type).

32. *P. lasiopoda* L. B. Smith in Proc. Amer. Acad. 70: 153 (1935). Leaves and scape unknown. Inflorescence laxly bipinnate, tomentose-lepidote. Primary bracts ovate, exceeding the long, slender, sterile bases of the branches, minutely serrate, submembranaceous, red. Racemes secund, dense, ellipsoid, 10 cm. long, 5 cm. in diameter. Floral bracts like the primary bracts but smaller and entire, about equaling the sepals. Flowers erect. Pedicels slenderly obconic, 7 mm. long. Sepals narrowly lanceolate, uncinata at apex, 45 mm. long, ecarinate. Petals acute, 6 cm. long, dark violet. Stamens about equaling the petals or slightly exserted. BENI: YACUMA: Reyes, 500 m., *Rusby* 2232 (NY; type). PUNO: CARABAYA: Ollachea to Quillabamba, *Vargas* 17515 (US).

33. *P. Ugentiana* L. B. Smith in *Phytologia*, 13: 147, t. 7, fig. 1, 2 (1966). Leaf-blades 6 cm. wide, obscurely lepidote between the nerves beneath, covered with appressed cinereous scales above, the spines antrorse, 3 mm. long. Scape 5 cm. in diameter, soon glabrous. Scape-bracts persistent, exceeding the internodes, the upper broadly triangular with short serrate blades, partly exposing the scape. Inflorescence lax, bipinnate, over 1 m. long, finely and densely whitish-stellate including the petals. Primary bracts much shorter than the axillary branches. Spikes subspreading, strobilate, subsessile, the central ones to 17 cm. long. Floral bracts lanceolate, acute, nearly 5 cm. long and about equaling the sepals. Pedicels slenderly subcylindric, 15 mm. long. Sepals lanceolate, narrowly obtuse, 30 mm. long. Petals linear. Capsules subglobose, 2 cm. long. CHUQUISACA: OROPEZA: Sucre to Aiquile, 1950 m., *Ugent* 4998 (US; type; WIS).

34. *P. ctenorhyncha* L. B. Smith in *Phytologia*, 5: 49, t. 7, fig. 6-9 (1954). Plant 1.2 m. high. Leaf-blades 35 mm. wide, glabrous above, covered beneath with appressed, gray scales, the spines lax, red-brown, 4 mm. long. Scape stout, white-lanate. Scape-bracts erect and exceeding the internodes but not wholly covering the scape, broadly ovate with small, subfoliaceous blades, very dark brown, subcoriaceous, persistent, serrate, floccose. Inflorescence densely bipinnate, fusiform, 3 dm. long, 8 cm. in diameter, densely white-lanate. Primary bracts like the scape-bracts but their narrowly triangular apices notably pectinate and not at all foliaceous, 6 cm. long, equaling or exceeding the globose, few-flowered spikes. Floral bracts elliptic, apiculate, 35 mm. long, exceeding the sepals. Pedicels rather slender, 7 mm. long. Sepals elliptic, broadly acute, 20 mm. long, coriaceous. Petals 4 cm. long, light yellow-green. LA PAZ: LARECAJA: Anilaya to Larecaja, 3500 m., *Cárdenas* 4867 (US; type).

35. *P. Fosteriana* L. B. Smith in *Journ. Wash. Acad. Sci.* 40: 216, fig. 1 (1950). Plant 1 m. high. Leaf-blades 5 cm. wide, glabrous above, minutely pale-lepidote between the nerves beneath, the spines dark, flat, straight or uncinuate, 9 mm. long. Scape very short, concealed by the leaves. Inflorescence very densely bipinnate, thick-cylindric, rounded at apex, densely brown-lanate. Primary bracts membranaceous, pale green, the suborbicular base equaling the sepals, the long, narrowly triangular apex reflexed, coarsely serrate. Branches much abbreviated, few-flowered. Floral bracts broadly elliptic, long-caudate, exceeding the sepals, subentire, membranaceous, lightly green, drying stramineous. Pedicels rather slender, 1 cm. long. Sepals linear-lanceolate, acute, 45 mm. long, ecarinate, minutely and sparsely serrate, submembranaceous. Petals broadly elliptic, ultramarine, dark purple at base. LA PAZ: MURILLO: La Rinconada, about 75 km. east of La Paz, 4400 m., *M. B. Foster* 2573 (US; type).

36. *P. tristis* L. B. Smith in *Phytologia*, 10: 475, t. 1, fig. 5-7 (1964).

Flowering 6 dm. high. Leaf-blades 15 mm. wide, glabrous above, covered beneath with appressed white scales, laxly serrate with dark uncinuate spines 4 mm. long. Scape exceeding the leaves, coarsely brown-tomentose. Scape-bracts subfoliaceous, strict, densely imbricate, brown-tomentose toward base. Inflorescence densely ovoid, broadly rounded, 10 cm. long, 8 cm. in diameter, obscurely bipinnate, densely and coarsely brown-tomentose except the petals. Primary bracts attenuate from a suborbicular base, to 7 cm. long, membranaceous, finely nerved, entire, the apical half reflexed at anthesis. Branches nearly aborted, 2-flowered. Floral bracts like the primary bracts but short-attenuate and only 35 mm. long. Pedicels short but slender and distinct. Sepals oblong-elliptic, rounded and apiculate, 18 mm. long, thin. Petals over 3 cm. long, blue. COCHABAMBA: CHAPARE: km. 89, Cochabamba to Chapare, 3900 m., *Cárdenas* 6067 (US; type).

37. *P. leptostachya* L. B. Smith in *Lilloa*, 14: 97, fig. 11, 12 (1948). Flowering 4-5 dm. high. Leaf-blades 12 mm. wide, glabrous above, covered beneath with subappressed, cinereous, black-centered scales, the spines lax, dark, uncinuate, 4 mm. long. Scape short. Scape-bracts very densely imbricate, shortly foliaceous-laminate from a broadly elliptic, subchartaceous, lepidote sheath. Inflorescence slenderly cylindrical, depauperate-paniculate, 3 cm. in diameter. Primary bracts acuminate from a broadly ovate base, 5 cm. long, entire, membranaceous, sparsely brown-lanate at base, strongly reflexed above the middle. Branches nearly aborted, 2-flowered, wholly hidden. Floral bracts elliptic, acuminate, 25-30 mm. long, much exceeding the sepals, entire, membranaceous, brown-lanate. Pedicels slenderly obconic, 4 mm. long. Sepals elliptic, broadly acute or obtuse, 17 mm. long, thin, ecarinate, strongly nerved, lanate. Petals 3 cm. long, blue. COCHABAMBA: CHAPARE: Cuesta de Llanta, Aduana near Colomi, 3400 m., *Cárdenas* 3581 (GH, type). Peru.

38. *P. Cardenasii* L. B. Smith in *Lilloa*, 14: 94, fig. 6 (1948). Plant 1.5 m. high. Leaf-blades 3 cm. wide, nearly glabrous, the spines very lax, brown, straight or curved, 8 mm. long. Scape very short, hidden by the leaves. Inflorescence densely cylindrical, appearing simple but actually bipinnate, 25 cm. long, 12 cm. in diameter, pale-lanate, glabrous in fruit. Primary bracts ample, about equaling the branches, obscurely serrulate, membranaceous, reflexed, fragile. Branches densely few-flowered. Floral bracts like the primary bracts, exceeding the sepals. Pedicels slenderly obconic, 10 mm. long. Sepals broadly lanceolate, acute, 25 mm. long, ecarinate, thin-coriaceous. Petals 4 cm. long, blue. COCHABAMBA: CERCADO: Tunari, 3800 m., *Cárdenas* 4082 (US; type); 3900 m., *M. B. Foster* 2540 (US).

39. *P. Herzogii* Wittm. in *Meded. Rijks Herbar.* 29: 86 (1916). Flowering 2 m. high. Leaf-blades 2 cm. wide, glabrous above, densely cinereous-lepidote beneath, minutely spinose-serrate. Scape erect or

slightly curved, elongate, stout, much exceeding the leaves. Scape-bracts refracted, soon deciduous. Inflorescence densely cylindric or ellipsoid, compound, 2-3 dm. long, covered with a yellowish-white wool. Primary bracts large, broadly ovate or obovate with a deltoid apiculus, fuscous when dry, suberose, slightly exceeding the few-flowered spikes, recurved toward apex; floral bracts like the scape-bracts, equaling or slightly exceeding the sepals. Pedicels 10 mm. long. Sepals ovate-oblong, subacute, 30 mm. long, covered on both sides with a dense easily detached wool. Petals 5 cm. long, flavous. Stamens included. COCHABAMBA: CHAPARE: Incacorral, *Herzog* 2269 (L; type); Colomi, 3300 m., *Cárdenas* 2251 (GH); AYOPAYA: Sailapata, 3700 m., *Cárdenas* 3306 (US); CERCADO: Tunari, *Kuntze* s. n. (NY); 3600 m., *M. B. Foster* 2541 (US); *Cárdenas* 6276 (US); TOTORA: Incallajta to Carrasco, *Cárdenas* 6275 (US).

40. *P. tunarensis* Mez in DC. Monog. Phan. 9: 498 (1896). Flowering 4-7 dm. high. Leaf-blades 3 dm. long, 15 mm. wide, woody, very stiff, densely cinereous-lepidote beneath, the spines dense, subspreading, 5 mm. long. Scape short, stout. Scape-bracts erect, imbricate, broadly ovate, acuminate. Inflorescence simple, densely cylindric, 20 cm. long, 3 cm. in diameter, many-flowered. Floral bracts elliptic or ovate-elliptic, apiculate, 20 mm. long, about equaling the petals but decurved at apex, entire, scarious, pulverulent-lepidote, flavous. Pedicels very short. Sepals ovate-elliptic, acuminate, 14 mm. long, carinate, coriaceous, flavous, subglabrous or sparsely lepidote. Petals 17 mm. long, dull red-brown. Stamens exserted. COCHABAMBA: CERCADO: Tunari, 1400 m., *Kuntze* s. n. (NY; type); Toralapa to Cochabamba 3700 m., *Cárdenas* 3580 (US); TOTORA: Quirusillani, 3800 m., *Cárdenas* 2372 (GH); TARATA: Anzaldo, 3600 m., *Cárdenas*, *Cutler & Gandarillas* 7639 (US); Cocha to Vilavila, 2850 m., *M. B. Foster* 2555 (US).

41. *P. nana* Wittm. in Mededeel. Rijks Herb. 29: 85. (1916). *Pitcairnia nana* (Wittm.) L. B. Smith in Contrib. Gray Herb. 89: 7 (1930). Leaves many in a spreading rosette, the blades linear-triangular, over 6 dm. long, 25 mm. wide, glabrous above, densely cinereous-lepidote beneath, laxly serrate with dark antrorse spines 5 mm. long; scape very short and hidden; inflorescence semiglobose, dense, 15 cm. in diameter. Outer bracts ovate or ovate-oblong with a narrowly deltoid apex, entire, 45-50 mm. long, 15-20 mm. wide, subcoriaceous, lustrous, roseate, drying to yellow-brown with a very dark base, subfurfuraceous to glabrous. Floral bracts like the outer bracts but narrower and more furfuraceous, about equaling the sepals. Pedicels broadly obconic, 15 mm. long, compressed. Sepals narrowly lanceolate, attenuate to a pungent apex, 35-40 mm. long, 10 mm. wide, carinate. Petals subacute, slightly exceeding the sepals, naked, blue-green. Stamens barely exserted. Ovary $\frac{1}{4}$ inferior. Ovules winged.

SANTA CRUZ: VALLE GRANDE: Samaipata, 2100 m., *Herzog* 1856-a (L; type); same, alt. 1800 m., *Cárdenas* 5533 (US).

42. *P. humilis* Mez in DC. Monog. Phan. 9: 498 (1896). *P. Werdermannii* Harms of Catalogue. Cespitose with a rhizome 15 cm. in diameter, the flowering shoot 15-25 cm. high. Leaf-blades 7 mm. wide, cinereous-lepidote especially beneath, the spines lax, spreading, 3 mm. Scape very short, white-tomentellous, becoming glabrous. Scape-bracts densely imbricate, broadly ovate-elliptic with foliaceous blades. Inflorescence simple, strobilate, fusiform, 6-8 cm. long, 25 mm. in diameter, few-flowered, the axis densely white-tomentose. Floral bracts strict, broadly ovate, acuminate, 20-28 mm. long, exceeding the petals, entire, pungent, appressed-lepidote, becoming glabrous, nerved. Pedicels 2-3 mm. long. Sepals subtriangular, acutish, 12-13 mm. long, carinate, sparsely lepidote, becoming glabrous especially toward apex. Petals obtuse, 15-20 mm. long, about equaling the stamens, blue or violet. COCHABAMBA: CHAPARE: Sacaba, 3000 m., *Kuntze* s. n. (NY; type); Incachaca, 2800 m., *Werdermann* 2006 (B, type of *P. Werdermannii* Harms); TOTORA: Siberia, Comarapa to Pojo, *Vogel* 468 (US). POTOSI: PORCO [?]: Tagua Comuña, 4200 m., *West* 6370 (UC). CHUQUISACA: SUCRE: Guerralona, 3000 m., *Cárdenas* 4128 (US).

43. *P. Brittoniana* Baker, Handbk. Bromel. 124 (1889). Leaf-blades 15-18 mm. wide, glabrous above, sparsely white-lepidote beneath, the spines lax, spreading, uncinata, brown, 5 mm. long. Scape stout. Scape-bracts densely imbricate, the upper ovate with a foliaceous blade, lanate. Inflorescence simple, densely cylindrical, over 15 cm. long, densely pale-ferruginous-lanate. Floral bracts ovate, acuminate, 60 mm. long, 38 mm. wide, equaling or exceeding the flowers, entire, thin-coriaceous. Sepals lance-oblong, acute, 22 mm. long, coriaceous. Petals obtuse, 4 cm. long, green. Stamens included. LA PAZ: LARECAJA: Ingenio del Oro between Sorata and Mapiri, 3000 m., *Rusby* 2849 (NY; type).

44. *P. Weddelliana* (Baker) Mez in DC. Monog. Phan. 9: 475 (1896). Caudex large, forking, stout, bearing rosettes of leaves at the apices of the branches. Leaf-blades 4 cm. wide, glabrous and glaucous above, pale-lepidote beneath, the spines straight, erect, slender, red, 5 mm. long. Scape 1.5 m. high, much exceeding the leaves. Inflorescence amply paniculate, very densely pyramidal, many-flowered. Branches many-flowered and white-tomentose toward base, sterile, bracteate, and glabrous toward apex. Floral bracts lanceolate, acute, 15 mm. long, exceeded by the sepals, entire. Flowers erect. Pedicels 10 mm. long. Sepals subobtuse, 18 mm. long, becoming glabrous. Petals obtuse, 35 mm. long, the blade bright blue. Stamens included. CHUQUISACA: CINTI: Culpina, *Correll et al* B-644 (US); TARIJA:

PROVINCE [?]: *Weddell* 4001 (P; type); MENDEZ: San Lorenzo, 1800 m., *Cárdenas* 210 (GH).

45. *P. Raimondii* Harms in *Notizbl.* 10: 213 (1928). "Chuqui Kayara." Plant columnar, 9.5 meters high, dying after the formation of fruit, the caudex simple, erect, 4 m. high, 6 dm. in diameter, surmounted by the dense leaf-rosette. Leaves very many, 1-1.25 m. long, the blades 9 cm. wide, the spines lax, stout, uncinata, dark brown, 10 mm. long. Scape very short and stout, hidden by the leaves. Inflorescence densely bipinnate, slenderly cylindrical, attenuate, 4.3 m. long, 6 dm. in diameter, white-lanate throughout. Primary bracts broadly ovate, apiculate, much shorter than the branches, entire, membranaceous, white. Branches spreading or reflexed, sterile toward apex. Floral bracts densely imbricate, ovate-lanceolate, acuminate, exceeding the sepals, membranaceous, subglabrescent. Pedicels cylindrical, stout, 15 mm. long. Sepals lanceolate, acute, 4 cm. long. Petals 6-8 cm. long, greenish white, often purplish, the blade broad. LA PAZ: INGARI: Comanche, 75 km. southwest of La Paz, *Rose* 18875 (NY, US); 4050 m., *M. B. Foster* 2566 (US); COCHABAMBA: CERCADO-CHAPARE: Huacanqui, 3000 m., *Cárdenas* 4380 (US); 2400 m., *M. B. Foster* 2546 (US); TARATA: Tarata, 3900 m., *Miller* (US); TOTORA: Totorá, 3800 m., *Cárdenas* 2371 (GH); COCHABAMBA-SUCRE: Cuesta de Alalas, *Furlong* (GH). Peru. Fig. 1.

Excluded Species:

P. boliviensis Baker of Catalogue. Endemic to Chile.

P. micrantha Mez of Catalogue. Endemic to Argentina.

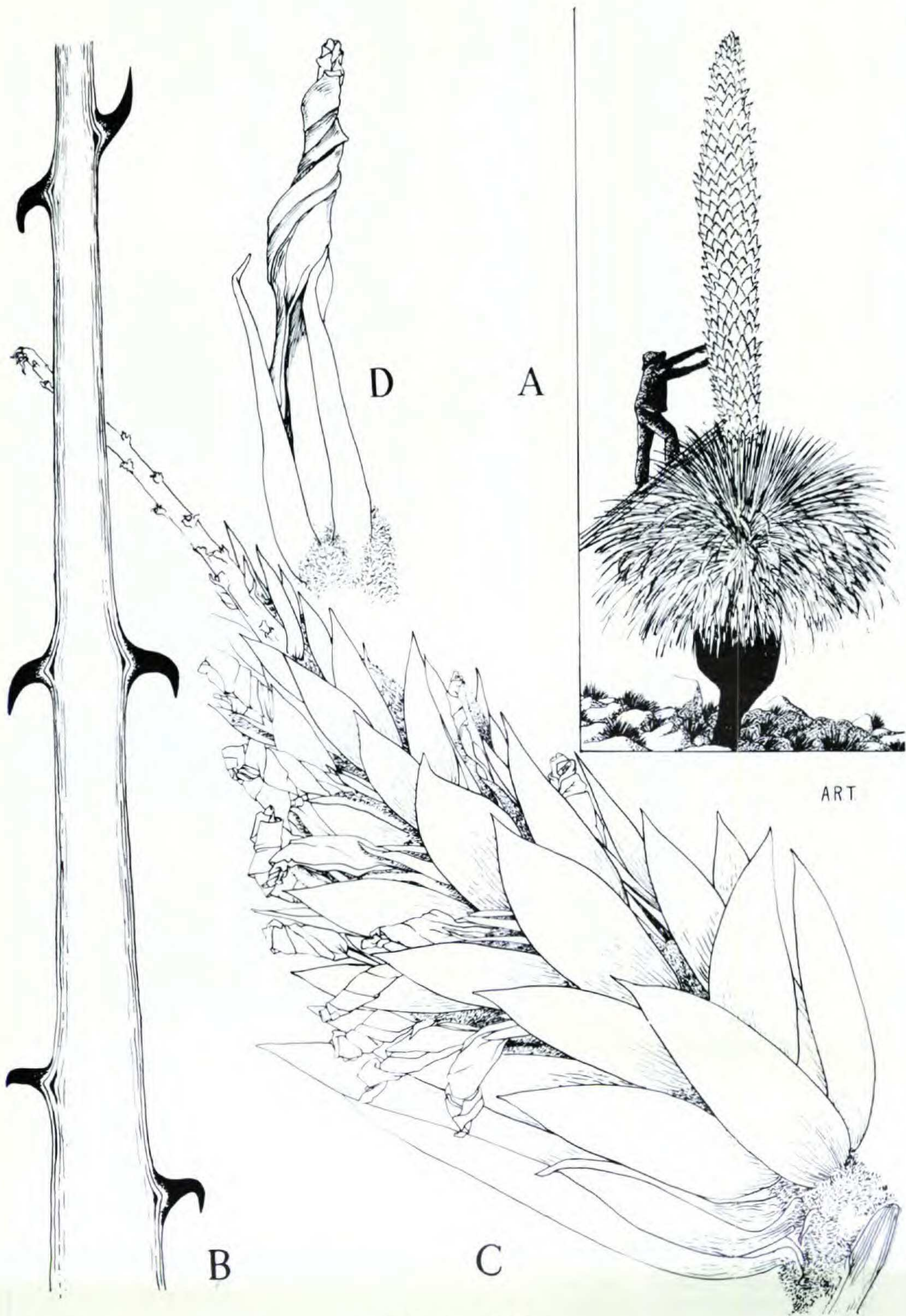


Figure (1)

A: *Puya Raimondii* (after Cárdenas 4380), habit from photo; B: section of leaf $\times 1$; C: branch of inflorescence $\times 1/2$; D: flower