

A TAXONOMIC REVISION OF PODOCARPUS

IV. THE AMERICAN SPECIES OF SECTION EUPODOCARPUS,
SUB-SECTIONS C AND D

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With eight plates

THERE IS NOW a large amount of *Podocarpus* material, Section *Eupodocarpus*, available in American herbaria which has made possible new interpretations of old material and brought to light a number of new entities in the regions of Central and South America. The group of plants considered as a whole are characterized by a wide variation in size of plant, from shrub to tree over 35 m. tall, and in appearance of the ever-green foliage, the leaves varying from 1.5 cm. to 24 cm. long and 3 mm. to 22 mm. wide. The leaves are symmetrically flattened and in leaf cross-section uniformly show upper hypoderm, a single vascular bundle with a single resin canal below and flanked by wing-like transfusion tissue, stomata only on lower surface, and palisade only on the upper side. Sub-section D, represented in this region by the single species, *P. nubigenus*, has the only American species in this section without organized accessory transfusion tissue and was noted by Orr (The Leaf Anatomy of *Podocarpus* in Trans. Proc. Soc. Edinburgh 34 (1): 1-54. 1944). All other species belong to Sub-section C and show well-developed accessory transfusion tissue extending from above and below transfusion tissue to margin of leaf. The upper hypoderm was found to be interrupted only in *P. guatemalensis*, its varieties *pinetorum* and *Allenii*, *P. Cardenasii*, *P. Sprucei*, and *P. salignus*. Orr found interrupted hypoderm also in *P. Parlatoresi* but in the examination of four specimens from Argentina and one from Bolivia we found no evidence of interruption. Auxiliary sclereids in palisade and mesophyll were first described by Orr in *P. oleifolius*. These are a constant character of *P. pendulifolius*, *P. Pittieri*, *P. Rusbyi*, and *P. Matudai*; are usually present in leaves of mature trees of *P. magnifolius* and are absent in about a third of the collections of *P. oleifolius* and its varieties. Fibers accompanying the vascular bundle are consistently absent in *P. Lambertii*, *P. Lambertii* var. *transiens*, *P. glomeratus*, *P. Cardenasii*, *P. Sprucei*, *P. tepuiensis*, *P. guatemalensis* (not its varieties) and *P. Parlatoresi*; are only rarely absent in *P. coriaceus*, *P. oleifolius* and *P. Reichei*; and are often absent in *P. Purdieanus*, *P. Urbanii*, and *P. salignus*.

KEY TO SECT. EUPODOCARPUS (AMERICAN SPECIES),

SUB-SECT. C AND D

Accessory transfusion tissue absent.

Sub-sect. D.

29. *P. nubigenus.*

Accessory transfusion tissue well-developed.

Sub-sect. C.

Leaves not pungent or spine-tipped.

Leaves relatively large, broad, flat, usually more than 6 cm. long, 5 mm. wide; terminal bud scales long-acuminate, 3-4 or more times as long as wide.

Upper surface of leaf flat or very slightly grooved with the groove between two ridges above midvein, becoming essentially flat toward the tip; hypoderm continuous above.

Leaves with vascular sclereids; without accessory sclereids.

Leaves linear-lanceolate, attenuate, elongate-falcate, usually 10-13 cm. or more long, 10-15 mm. wide. Upper epidermal cells 55-119 microns long. Female peduncles 7-10 mm. long; seed usually more than 8 mm. long, ridged along back and bluntly crested (Caribbean).....1. *P. coriaceus.*

Leaves lanceolate, rather short angustate, acuminate, 6-10 cm. long, 5-15 mm. wide, the lower leaves petioled; epidermal cells 24-66 microns long. Female peduncles 4-7 mm. long; seed up to 7 mm. long.

Leaves 6-10 cm. long, 7-12 mm. wide. Pollen cones 3 cm. long (Brazil).....2. *P. Sellowii.*

Leaves 6 cm. long, 5-9 mm. wide. Pollen cones 1-2 cm. long.....2a. *P. Sellowii* var. *angustifolius.*

Leaves with both vascular sclereids and accessory sclereids, linear-lanceolate, attenuate, falcate, 8-14 cm. long, 8-15 mm. wide, flat above except for ridge at petiole and upwards. Female peduncles 11-24 mm. long, slender. Seed nearly spherical or somewhat pear-shaped, 10-12 mm. long or longer, ridged along back and crested (Venezuela).....3. *P. Pittieri.*

Upper surface of leaf raised above midvein, leaves usually 6-10 cm. long, 5-7 mm. wide.

Hypoderm interrupted above. Male cones axillary, solitary though aggregated near tip of branchlets, filiform, 3-3.5 cm. long, about 1 mm. wide. Seeds narrowly oblong-ovoid with a large blunt crest. Epidermal cells 15-40 microns wide (S. Chile).....

.....20. *P. salignus.*

Hypoderm continuous above. Leaves large, 6-15 cm. long, epidermal cells 8-20 microns wide.

Lower vascular and auxiliary sclereids both absent. Female peduncles 9-18 mm. long; seeds sub-globose, more than 12 mm. long (Mexico).....4. *P. Reichei.*

Vascular sclereids and auxiliary sclereids both present.

Female peduncles short, not over 7 mm. long; seeds less than 10 cm. long.....5. *P. Matudai.*

Female peduncles long, 9-18 mm. long; seeds very large, more than 12 mm. long.....

.....5a. *P. Matudai* var. *macrocarpus.*

Leaves large (more than 6 cm. long and 5 mm. wide, with a distinct groove above the midvein) or small (with or without groove and less than 6 cm. long and 5 mm. wide).

Bud scales long, slender-attenuate, 3-4 times as long as wide.

- Leaves with a ridge above midvein, or a groove between two ridges, sometimes becoming flat toward tip, at most 5 cm. but usually less than 3 cm. long, oblanceolate. Hypoderm continuous above; vascular sclereids present; auxiliary sclereids absent. Female peduncles 5 mm. long, receptacle 6 mm.; seed 6 mm. long (N. Brazil).....6. *P. Roraimae*.
- Leaves with a distinct groove on upper side above midvein.
 Leaves more than 4 cm. long; epidermal cells 32-74 microns long.
 Leaves linear-lanceolate, 4-8 cm. long, 6-11 mm. wide, with revolute margin; stiffly arched-spreading, recurved; vegetative bud scales very large, becoming foliaceous (Venezuela).....7. *P. Steyermarkii*.
- Leaves ovate-lanceolate, oblong or obovate, thick and stiff, 5-12 cm. long, 12-17 mm. wide (on vigorous shoots and saplings up to 17 cm. long and 24 mm. wide).....
8. *P. magnifolius*.
- Leaves less than 4 cm. long, lanceolate, somewhat channeled, 2-3.5 cm. long, 4-7 mm. wide. Vascular and auxiliary sclereids both present; epidermal cells 11-22 microns long. Female peduncles 3-4 mm. long; receptacle well developed, conically spreading, often 2-seeded; seeds 7 mm. long (Bolivia).....9. *P. Rusbyi*.
- Bud scales ovate, acute, obtuse or apiculate but not attenuate.
 Bud scales apiculate.
 Leaves small, less than 2.5 cm. long, 4-6 mm. wide, divaricately spreading, with a distinct groove above midvein, lanceolate. Vascular sclereids and auxiliary sclereids both absent (SE. Venezuela).....10. *P. tepuiensis*.
- Leaves large, more than 4 cm. long and 7 mm. wide.
 Leaves essentially flat above, upper hypoderm continuous.
 At least some of the leaves on reproductive branches spine-tipped, with a ridge beneath midvein. Vegetative bud scales apiculate and very thick at base, leaving transverse rhomboidal scars on stem (Jamaica).....11. *P. Purdieanus*.
- Leaves never spine-tipped, oval, flat above or with only an inconspicuous groove between low ridges above and having a shallow 1 mm. wide groove beneath midvein (Trinidad).....12. *P. trinitensis*.
- Leaves linear-lanceolate with a ridge above midvein; upper hypoderm interrupted.
 Vascular sclereids and auxiliary sclereids absent. Vegetative buds small with scales having relatively long apiculus (Guatemala, Brit. Honduras).....
13. *P. guatemalensis*.
- Vascular sclereids present, auxiliary sclereids absent. Vegetative buds larger, bud scales obtuse, often short-apiculate.
 Epidermal cells 22-66 microns long (Brit. Honduras).....13a. *P. guatemalensis* var. *pinetorum*.
 Epidermal cells 11-31 microns long (Panama).....
13b. *P. guatemalensis* var. *Allenii*.
- Vegetative bud scales acute or obtuse, usually not apiculate.
 Leaves flat above or nearly so.

Leaves small, less than 4 cm. long (except in juvenile specimens), sometimes with a spine at tip, auxiliary sclereids absent.

Pollen cones fascicled; leaves erect or sub-patent.

Leaves broadly linear, acute or obtuse, very thick.

Pollen cones fascicled in 6 or more, on a scaly or leafy peduncle 15–20 mm. long, branched near top. Vegetative buds large, globose, with thin scales acute, obtuse or apiculate (Ecuador and Colombia).....21. *P. Sprucei*.

Leaves linear-lanceolate, moderately thick, broadly acute, 3–4 cm. long, 3–4 mm. wide. Vegetative bud scales obtuse or acute, not apiculate.

Pollen cones fascicled in 3–6 on a naked peduncle up to 10 mm. long (Brazil)...22. *P. Lambertii*.

Pollen cones axillary; leaves patent or more spreading, linear-lanceolate, usually with a pungent spine at tip, sometimes without, 2.5–3 cm. long or longer.

Pollen cones cylindrical, 4–5 mm. in diameter, on very short peduncles. Vegetative bud scales broad, acute or obtuse (Jamaica).....14. *P. Urbanii*.

Leaves large, more than 6 cm. long, essentially flat (or with suppressed or inconspicuous groove between two ridges above), angustate, falcate, becoming 11 cm. long and drooping, with margin smooth and swollen, never revolute; auxiliary sclereids present (W. Venezuela).....

.....15. *P. pendulifolius*.

Leaves with a distinct groove above midvein.

Leaves large, usually more than 3–4 cm. long, 7 mm. wide; vascular and auxiliary sclereids present.

Leaves linear-lanceolate, attenuate. Male cones sessile.

Female peduncles 5–10 mm. long; seeds spherically elongated, their crests small (S. Mexico to Peru).....

.....16. *P. oleifolius*.

Leaves oblanceolate (or oval) broadly acute or obtuse; pollen cones on peduncles 3–5 mm. long; seeds relatively longer than above, ridged at back, with prominent crest.....

.....16a. *P. oleifolius* var. *macrostachyus*.

Leaves intermediate between the above species and variety; pollen cones peduncled; female peduncles and seeds similar to *P. oleifolius* (Costa Rica)...

.....16b. *P. oleifolius* var. *costaricensis*.

Leaves somewhat longer and wider than var. *macrostachyus*, tending to be more obtuse rather than attenuate. Seeds as in var. *macrostachyus* but on peduncles 10–18 mm. long (W.

Venezuela)...16c. *P. oleifolius* var. *trujillensis*.

Leaves small, less than 2 cm. long and 7 mm. wide. Vegetative buds ovate acute, scales usually apiculate. Vascular and auxiliary sclereids both absent (SE. Venezuela).....

.....10. *P. tepuiensis*.

Leaves tipped by a spine (pungent).

Vegetative buds with scales acuminate or long-apiculate.

Leaves with accessory transfusion tissue. Pollen cones numerous, fascicled or grouped on a common peduncle.

Leaves broadly linear, rather short angustate, 1.5–5 cm. long, 2–4 mm. wide.

Leaves erect to sub-patent, 3–5 cm. long, 3–4 mm. wide, often with a broad open groove above. Female peduncles 3–5 mm. long. Hypoderm continuous (Peru).....17. *P. glomeratus*.

Leaves divaricate, 1.5–3 cm. long, 2–3 mm. wide, usually flat above, pale green and glaucous beneath; hypoderm interrupted (Bolivia).....18. *P. Cardenasii*.

Leaves narrowly linear, long-attenuate, 5–12 cm. long, up to 2.5 mm. wide. Female peduncles 7–8 mm. long; seed sub-globose, about 5 mm. long (Bolivia, Argentina).....19. *P. Parletorei*.

Leaves without accessory transfusion tissue, linear-lanceolate with 2 broad glaucous bands beneath (on each side of midvein). Pollen cones rarely fascicled or individually solitary and sometimes peduncled, may be aggregated near ends of twigs (sub-section D above).....29. *P. nubigenus*.

Vegetative buds with scales apiculate or obtuse.

Bud scales apiculate.

Leaves large 7–9 cm. long, 10–12 mm. broad, oblong-lanceolate, shiny above with midvein scarcely manifest, stiffly short mucronate (juvenile or vigorous lower branches may have larger leaves and lack the spine) (Jamaica).....11. *P. Purdieanus*.

Leaves less than 7 cm. long.

Leaves elliptical, 3–5 cm. long.

Leaves narrowly elliptical, 7–10 mm. wide. Female peduncle 3–5 mm. long, receptacle 4–5 mm. long. Seed 8–9 mm. long, conically crested (Cuba)...23. *P. Leonii*.

Leaves broadly elliptical, 10–13 mm. wide; female receptacle 15–20 mm. long. Seed 10 mm. long with conical crest (Cuba).....24. *P. Victorinianus*.

Leaves linear or lanceolate, 1–4 cm. long.

Leaves linear, about 4 cm. long, 6–7 mm. wide; female peduncle 3–4 mm. long; receptacle 5–7 mm. long; seed 7–8 mm. long (Cuba).....25. *P. angustifolius*.

Leaves elliptical, about 4 cm. long, 6–7 mm. wide; female peduncle about 3–4 mm. long; receptacle 6–7 mm. long; seed 7–8 mm. long (Cuba).....26. *P. aristulatus*.

Leaves 1.2–2 cm. long, 3–4 mm. wide; female cone sessile (or peduncle 1 mm. long), receptacle 4–7 mm. long, 3–4 mm. wide; seed 6–7 mm. long, crested (Cuba).....27. *P. Ekmanii*.

Vegetative bud scales obtuse, seldom with minute apiculus.

Leaves lanceolate, with and without a pungent spine at apex, less than 5 cm. long.

Leaves 2.5–3 cm. long or longer, 4–5 mm. wide, usually (but not always) spine-tipped. Pollen cones solitary and axillary. Female cone on a very short peduncle (Jamaica).....14. *P. Urbanii*.

Leaves 1.5–2.8 cm. long, 4–6 mm. wide, with sharp pungent 1–1.5 mm. long spine (Haiti).....28. *P. Buchii*.

Leaves similar, somewhat broader (Haiti).....28a. *P. Buchii* var. *latifolius*.

Leaves linear or linear-lanceolate.

Pollen cones fascicled 6 or more, on a branched scaly or leafy peduncle 15–20 mm. long; leaves erect or sub-patent, linear or broadly linear, up to 4 cm. long or longer. Seed sub-globose. Hypoderm interrupted (S. Colombia, Ecuador)...21. *P. Sprucei*.

Pollen cones fascicled, 3–6 on naked peduncle, up to 10 mm. long. Leaves narrowly oblong or linear-lanceolate, erect or patent, broadly acute, 3–4 cm. long, 3–4 mm. wide. Seed subglobose. Hypoderm continuous.

Leaves narrow.....22. *P. Lambertii*.

Leaves broader, up to 5 cm. long, 5 mm. wide.....

.....22a. *P. Lambertii* var. *transiens*.

1. *Podocarpus coriaceus* L. C. Richard in Ann. Mus. Hist. Nat. Paris 16: 297. 1810 (nomen). Comm. Bot. Conif. 14, pl. 1, fig. 3, 1826, not Hooker; Endlicher, Syn. Conif. 210. 1847, in part; Pilger in Pflanzenreich IV. 5(Heft 18): 87. 1903, in part; Urban in Symbolae Antill. 4: 71. 1903; Dallimore & Jackson, Handb. Conif. 40. 1923, 1931; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931; Marshall, Trees Trinidad & Tobago 94. 1934, in part;¹ Parlatore in DC. Prodr. 16(2): 509. 1868, in part; Grisebach, Fl. Br. West-Ind. Isl. 504. 1861; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Duss in Ann. Mus. Colon. Marseille 3: 608. 1897.
- Podocarpus antillarum* R. Br. ex Mirbel in Mem. Mus. Hist. Nat. Paris 13: 76. 1825 (nomen).
- Taxus* (?) *lancifolia* Wikström in Kongl. Vetensk. Acad. Handl. 76. 1827.
- Nageia coriacea* O. Kuntze, Rev. Gen. 2: 800. 1891, in part; Britton & Wilson in N. Y. Acad. Sci. 6: 326. 1926.
- Podocarpus salicifolia* Klotzsch & Karsten ex Endl. Syn. Conif. 209. 1847 (nomen dubium)²; Williams & Williams, Useful & Ornamental Plants of Trinidad & Tobago, ed. 3, 11. 1929.¹

A tree up to 20 m. tall, spreading, with divaricate branching. Bud scales at tips of vegetative shoots long acuminate, arising from a broad base, sometimes becoming foliaceous. Leaves crowded, spreading, straight to sub-falcate, coriaceous, lanceolate, gradually long acuminate toward the tip, acute, narrowing at base to a short petiole, 10–12 cm. long, about 10–11 mm. wide (larger in saplings and up to 22 cm. long and 17 mm. wide on lower sprout branches); midrib almost unnoticeable above or with a shallow groove, fairly broad and prominent beneath. Upper hypoderm continuous, rarely doubled except at margin and midrib, reinforced by rare larger fibers; epidermal cells 55–119 microns long and 18–33 microns wide. Pollen cones arising from buds axillary to leaves of previous year, solitary, sessile, cylindrical, surrounded at base by several large broad obtuse scales with the lowermost scales acutate, becoming 3–4 cm. long and 6 mm. wide. Microsporophylls with obtuse apiculus sparingly lacerulate. Seed cones solitary, axillary on short peduncles up to 7 mm. long; receptacle red, fleshy, 6–7 mm. long of 2–3 scales free at fleshy acute tips bearing solitary ovules. Seeds broadly ovoid or ellipsoid, up to 9 mm. long, 6–7 mm. wide, with distinct obtuse crests at apex and a slight ridge at back, with stony layer about 1 mm. thick.

DISTRIBUTION: Humid forests on hills and in wooded valleys of Caribbean islands from Puerto Rico eastward and southward to Trinidad.

¹ It is uncertain as to whether their reference to *P. coriaceus* L. C. Rich. applies here or to the *P. trinitensis* n. sp.

² Name applies to a Karsten specimen from unspecified locality in Colombia, and may represent another species rather than the Caribbean plant.

SPECIMENS EXAMINED:

PORTO RICO: Rio de Maricao, *Britton, Stevens & Hess* 2462 (†F, GH, †Mo, NY, US),* *Britton, Stevens & Hess* 2598 (NY, US), *Sintenis* 291 (†F, GH, †Mo, NY, US), *Velez* in 1928 (NY), *F. H. Sargent* 509 (†US); Cerro Gordo, San Germain, *Velez* 1102 (†NY); El Yunque, *Horn* 306 (†NY), *F. H. Sargent* 288 (†US); detailed location unknown, *Aboy* in 1933 (†UC-2 sheets).

MONTSERRAT: Chaner's Mt., *Shafer* 611 (†F, NY, US).

GUADELOUPE: *Duss* 2397 (†F, GH, †Mo, †NY-2 sheets, US), *Questel* 414 (US), *Stehle* 885 (US), *Anon.* in 1824 (†GH).

DOMINICA: Morne Plat Pays, *Hodge & Hodge* 1655 (†NY); Morne Nichols, *Hodge & Hodge* 1909 (†NY); Morne Trois Pitris, *Hodge* 1378 (NY); Mt. Diablotin, *Lloyd* 914 (†NY).

ST. KITTS: Mt. Misery, *Britton & Cowell* 372 (†NY-2 sheets, US).

MARTINIQUE: *Duss* 2097 (†F, GH, Mo, NY-2 sheets, Ph, US).

TOBAGO: Salem Charleston Trace, *Williams* 11787 (†NY).

TRINIDAD: *Britton, Britton & Hazen* 1007 (GH, †NY, US), *Anon.* in Sept. 1865 (†NY).

2. *Podocarpus Sellowii* Klotzsch in Endl. Syn. Conif. 209. 1847; Eichler in Fl. Brasil. 4(1): 431, pl. 113, fig. 1 and pl. 114. 1863; Carrière, Traité Conif. 2: 645. 1867; Parlatore in DC. Prodr. 16(2): 509. 1868; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Dallimore & Jackson, Handb. Conif. 55. 1923, 1931.

Podocarpus Selloi Pilger in Pflanzenreich IV. 5(Heft 18): 88. 1903, in Nat. Pflanzenfam. ed. 2, 13: 247. 1926; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 280. 1931.

An arborescent shrub up to 3 m. tall with branches and branchlets sub-opposite or 3–4 sub-verticillate. Buds, vegetative, with scales arising from an enlarged base, long acuminate, sometimes becoming foliaceous, up to 2 cm. long. New leaves moderately thin, becoming coriaceous, lanceolate, gradually narrowed above and below middle, acute, or sometimes tending to be caudate, the base merging very gradually with a distinct petiole, 6–10 cm. long, 7–12 mm. wide, those of vigorous shoots up to 15 cm. long and 16 mm. wide; with a slightly raised midrib above (a slight groove between two ridges) and a ridge below very pronounced near petiole and tending to disappear toward the tip. Hypoderm continuous above, vascular sclereids present above and below midvein, auxiliary sclereids absent; upper epidermal cells 24–66 microns long and 15–24 microns wide. Pollen cones narrowly cylindrical, about 3 cm. long, 2–2.5 mm. wide, solitary or fascicled, sub-sessile, surrounded at base by ovate-rotundate carinate scales; microsporophylls having triangular upturned, obtuse apiculus with lacerate margins. Female cones axillary and solitary on peduncles 5–12 mm. long; receptacle 5–8 mm. long, of 2 or 3 fused scales not equal in length, bearing a single ovule near the obtuse tip of the uppermost. Seeds spheroidally elongated, 7–9 mm. long, 5–7 mm. wide, with short blunt conical crest or crestless.

DISTRIBUTION: Southern Brazil.

SPECIMENS EXAMINED:

BRAZIL: Rio de Janeiro: *Glaziov* in 1872 (NY). Paraná: Roça Nova, *Dusén* 7502 (GH, NY, US); Alexandra, *Dusén* 15479 (A), *Dusén* 8094 (US); Porto

† This symbol preceding the letter representing the herbarium in which the specimen is located indicates that leaves from the specimen were studied in cross-section.

* The place of deposit of specimens is shown by the parenthetical letters as indicated in the first paper of this series.

de Lima, *Dusén* 7074 (GH, †Mo), *Dusén* 6982 (A, GH, Mo). Without specific locality: *Sellow* (ex Mus. Bot. Berlin) (ISOTYPE, F, GH, NY, UC-2 sheets); *Riedel* (ex Herb. St. Petersburg) (GH, †US); *Glaziou* 211 (ex Herb. Paris) (GH, †NY, US).

2a. *Podocarpus Sellowii* var. *angustifolius* Pilger in *Pflanzenreich* IV. 5(Heft 18): 88. 1903; Dallimore & Jackson, *Handb. Conif.* 55. 1923, 1931.

Differs from the species in having smaller, stiffer, more crowded leaves, more shortly angustate, usually up to 6 cm. long, 5–9 mm. wide, lighter in color on lower surface, with midvein below sometimes more prominent, the upper less distinct or with a groove between two low ridges tending to disappear toward the tip. Pollen cones smaller, 1–2 cm. long, 2 mm. wide, with apiculus of microsporophylls small or suppressed. Seeds unknown.

DISTRIBUTION: Southern Brazil.

SPECIMENS EXAMINED:

BRAZIL: Rio de Janeiro: *Glaziou* in 1888 (F). Paraná: Murungava, *Dusén* 16503 (US); Casa Ypiranga, *Dusén* 15428 (A, GH-2 sheets, †Mo-2 sheets, NY). Without specific locality (position of this specimen doubtful) *Barreto* 8493 (†F).

3. *Podocarpus Pittieri** n. sp.

Podocarpus coriaceus Pilger in *Pflanzenreich* IV. 5(Heft 18): 87. 1903, in part; sensu Pittier in *Man. Plantas Usuales Venez.* 258. 1926, non L. C. Rich.; sensu Knuth in *Fedde, Repert. Spec. Nov. Reg. Veg. Beih.* 43: 95. 1926, non L. C. Rich.; sensu Schnee in *Bol. Soc. Venezol. Cienc. Nat.* 9: 187. 1944, non L. C. Rich.

Arbor ad 10 m. alta, trunco ad 40 cm. diametro; foliis in ramulis subconfertis; alabastris summis perulis longe acuminatis insignitis, 5–15 mm. longis (interdum ad 25 mm., tum foliaceis); foliis coriaceis, lineari-lanceolatis, falcatis, angustatis, laevibus compressis, costa supra vix manifesta (petioli regione excepta), subtus elevata, 6–18 cm. longis, 7–16 mm. latis; strobilis masculis (*fide Schnee*) solitariis sessilibus basi squamulis nonnullis circumdatis, cylindricis, ad 4 cm. longis; strobilis femineis pedunculo gracili insidentibus, ad 12–24 mm. longis, receptaculo e squamis 2–3 coalescentibus demum incrassato-carnosis, 6–10 mm. longis, 5–7 mm. latis; seminibus late ovoideis, 8–12 mm. longis, 7–9 mm. latis, crista minima.

DISTRIBUTION: Coastal ranges of northern Venezuela in the dense high forests at 1400–2130 meters.

SPECIMENS EXAMINED:

VENEZUELA: Federal District: Altos de Galipan, Cerros del Avila, Boca de Tigre, altitude 1600 meters, *H. Pittier* 8298 (TYPE in †Gray Herb. Harv. Univ., F, US); *Lasser* 999 (†US); *Tamayo* 1382 (US); *Williams* 10633 (F); *Delgado* 205 (F, US); *Steyermark* 55098 (F, †Ill); Puerto la Cruz, *Jahn* 7395 (US); *Whitford* 50 (GH); upper cotiza near Caracas, *Pittier* 7396 (†GH, US); on crest near Caracas, *Curran and Haman* 1110 (GH, NY, US); east of El Junquito, *Steyermark* 57035 (F, †Ill); prope Coloniam Tovar, *Fendler* 1228 or 1288 (GH, †Mo, YU). Province unknown: *Williams* 9929 (F).

Inasmuch as up to this time these specimens have been included under *P. coriaceus* the leaf anatomy has been studied for comparison with the

* Named in honor of Dr. Henri Pittier, botanist in the Ministry of Agriculture, Venezuela, who, through collecting, publishing and directing research, has greatly increased the knowledge of the floras of Venezuela and Costa Rica.

above species and striking differences observed. In *P. Pittieri* the lower hypoderm fibers are almost twice as large as the upper while in *P. coriaceus* these are scarcely larger than the upper. Scattered in the palisade and mesophyll are found auxiliary sclereids (Plate I, Fig. 2). These are of the type resembling in shape the cells of the tissues in which they are found but enlarged and having thickened laminated pitted walls and lacking cell contents.

4. *Podocarpus Reichei** n. sp.

Podocarpus guatemalensis Reiche in Mexico Forestal 5: 77-78. 1927.

Podocarpus coriaceus Karsten in Ber. Deutsch Bot. Gesell. 11. 1897.

Arbor ad 20 m. alta, 6 cm. diametro, cortico griseo valde rimoso; perulis (alabastris vegetativis) longe attenuatis (Plate I, Fig. 1), rigidis erectisque, 4-10 mm. longis, apice tantum subreflexis; foliis crassis, coriaceis, lanceolatis, interdum falcatis acutisque, 7-12 cm. longis, 11-16 mm. latis, costa supra proeminente utrinque canaliculata margine subrevoluto; strobilis masculis solitariis vel geminatis, cylindricis ad 5 cm. longis; strobilis foemineis pedunculis 9-18 mm. longis fultis, bracteis sterilibus in receptacula confluentibus ovulum unicum vel duo obscure cristate proferentibus; receptaculo quam 12 mm. longiore, demum carnosio, sapido, rubescente, ultimo atro-brunneo; semine magno, ovoideo, obtuse cristato, grosse rugoso, ca. 15 mm. longo, 12-13 mm. crasso, in sicco 10-12 mm. tantum longo.

DISTRIBUTION: East central Mexico in mountains of Pueblo, Vera Cruz and San Louis Potosi at altitudes of 1000-3500 meters in mixed pine-hardwood-podocarpus forests on moist slopes.

SPECIMENS EXAMINED:

MEXICO: Puebla: Escarpment above Huauchinango, 6400 ft. *A. J. Sharp* 441222 (TYPE in †Herb. Univ. Ill., Tenn); region of Huauchinango, *Reiche*, in 1927 (†US); *Gilly*, in 1943 (†Ill, Mex); *Sharp* 45338 (†Ill, Tenn), *Sharp* 45338a (†Ill, Tenn), *Sharp* 441227 (†Ill, Tenn). San Louis Potosi: Cerro Prieto west of Xilitla, *Sharp* 46286 (†Ill, Tenn). Vera Cruz: below Atzalan, *Sharp* 46150 (†Ill, Tenn). Cultivated: near Jalapa, *Rose & Hay* 6192 (†US).

COSTA RICA: Calle de Guadalupe, *Orozco* 324 (F).

The leaf cross-sections show a continuous upper hypoderm of small fibers, 14-18 microns in diameter, with the lower scarcely any larger. Auxiliary sclereids are absent in the palisade and mesophyll and only upper vascular sclereids are present. For such large leaves, this lack of supporting sclereids is notable. In fact, the amount of sclerotic tissue seems to bear no relation to the size of the leaves as the very small leaves of other species are often abundantly supplied. The upper epidermal cells are long and narrow, not over 16 microns wide, and the walls are not wavy. Pollination, according to *Reiche*, in April and May.

5. *Podocarpus Matudai* Lundell in Phytologia 1(6): 212. 1937.

A large tree, sometimes with trunk up to 1.5 m. or more in diameter. Terminal buds large with angustate-lanceolate, somewhat spreading scales.

* Named in honor of the late Prof. Karl Reiche, an eminent explorer in plant geography and an authority of the floras of Mexico and Chile. From 1911-1920 he was professor of botany at the National University of Mexico, during which time he published a number of carefully prepared treatises in botany and biology.

Leaves coriaceous, lanceolate, narrowly acute at apex, narrowed to a petiole below, with a somewhat rounded ridge above midvein, becoming less prominent toward apex and less prominent below, 4–9 cm. long, 10–15 mm. wide on mature reproductive branches (up to 16 cm. long and 19 mm. wide on vigorous shoots). Leaf cross-sections show scattered auxiliary sclereids in palisade and mesophyll and vascular sclereids both above and below bundle. Pollen cones sessile, cylindrical, arising from axillary buds of previous season's growth, becoming 3–3.5 cm. long, 4 mm. wide, surrounded by broad, carinate apiculate scales, shedding pollen in January or later. Microsporophylls with upturned obtuse apices with scarious, denticulate margins. Seed cones on short peduncles 4–6 mm. long, receptacle of a pair of fused thickened scales 4–6 mm. long, with short obtuse apices. Seed 8–10 mm. long, 7–8 mm. wide, with a blunt crest scarcely evident.

DISTRIBUTION: Fog forests in southern Mexico at 1250–2370 m.

SPECIMENS EXAMINED:

MEXICO: Chiapas: Mt. Pasitar, *Matuda* 698 (type coll., †Mich, US), *Matuda*, January 1937 (†GH); Mt. Ovando, *Matuda* 1847 (†Mich, †A), *Matuda* 956, July 1938, (A, †F, NY, US), *Matuda* 698, December 1936, (F); Triunfo, *Xolocotzi & Sharp* 45978 (†Ill, Tenn).

5a. *Podocarpus Matudai* var. *macrocarpus* n. var.

A speciei forma typica differt seminibus valde majoribus ecristatis, receptaculo minore, 12–17 mm. pedunculato (Plate II, Fig. 1); seminibus epicarpio haud exsiccato subsphaericis ad 18 mm. longis, 14 mm. latis (Plate II, Fig. 2). Perulis formae typicae at brevioribus; strobilis masculis 4–5 cm. longis, in anthesi quam speciei fortasse longioribus.

DISTRIBUTION: In southern Mexico, State of Chiapas, and in adjacent mountain ranges of Guatemala. Altitude 200–2600 meters, moist slopes in cloud forests and below.

SPECIMENS EXAMINED:

MEXICO: Chiapas: Mt. Ovando, *Matuda* 956, April 1936 (TYPE in †Herb. Univ. Mich., †A), *Matuda* 698, August 1936 (†GH), *Matuda*, November 1939, (†F).

GUATEMALA: Dept. Huehuetenango: Sierra de los Cuchumatanes, Cerro Huitz, *Steyermark* 48589 (†F), *Steyermark* 48543 (†F); Cerro Canana, *Steyermark* 49105 (†F); between Xoxlac and Nucapuxlac, *Steyermark* 48921 (†F); between Cerro Chiblac and Finca San Rafael, *Steyermark* 49472 (†F). Dept. Chiquimula: Cerro Brujo, *Steyermark* 31091 (†F). Dept. El Progreso: between Finca San Miguel and summit of mountain, *Steyermark* 43803 (†F). Dept. Guatemala: *Aguilar* 613 (†F).

The pollen cones mature earlier than in the species, are 5–6 cm. long in August, probably shedding their pollen in autumn.

6. *Podocarpus Roraimae* Pilger in Notizbl. Bot. Gart. Berlin 5: 299. 1913; Ule in Bot. Jahrb. 52(Beibl. 115): 48. 1914; Knuth in Fedde, Repert. Spec. Nov. Reg. Veg. Beih. 43: 95. 1928; Gleason in Bull. Torrey Bot. Club 58: 315. 1931.

A tree 10–15 m. tall with dense foliage crowded on numerous branched branchlets. Terminal buds globose with outer scales acuminate-attenuate, becoming foliaceous from an enlarged base. Leaves oval or obovate to oblanceolate, shortly rotundate-angustate, at tip somewhat obtuse, gradually narrowed toward base into a short petiole, 1.5–3 cm. long, 4–7 mm. wide (those of vigorous lower branches and juvenile foliage shortly subapiculate, up to 6 cm. long and 8 mm. wide), shiny dark green above, dull

green beneath, with an indistinct ridge above the midvein, often replaced (especially toward tip) by two smaller ridges with a groove between. Leaf cross-sections show hypoderm continuous, reinforced by larger fibres; no auxiliary sclereids in palisade or mesophyll (Plate I, Fig. 3). Pollen cones unknown. Female peduncle 4–5 mm. long, receptacle 6 mm. long, 4 mm. wide. Seed elongated, 6 mm. long, 4 mm. wide, with ridge and minute crest.

DISTRIBUTION: Venezuela-Brazil border westward to Mt. Duida at 2000–3000 m.

SPECIMENS EXAMINED:

VENEZUELA: State of Bolivar: Mt. Roraima, *Ule* 40 (type photograph GH, fragment †F); *Steyermark* 58949 (F-2 sheets, †Ill); Mt. Duida, summit of Peak No. 7, *Tate* 659 (NY, †US).

7. *Podocarpus Steyermarkii** n. sp.

Arbor 7–12 m. alta; ramulis foliis confertis insignitis, alabastris summis squamis longe attenuatis 5–16 mm. longis (vel longioribus tum subfoliaceis); foliis coriaceis, lanceolatis, arcuatim patentibus, 4–8 cm. longis, 6–11 mm. latis, supra laete viridibus, per costam bene sulcatis, margine subrevolutis, subtus pallidioribus ad subargenteis, costa elevata; strobilis masculis ignotis; strobilis foemineis pedunculis crassis 7–10 mm. longis fultis, receptaculo 7–8 mm. longo; semine viridi subargenteo, grosse striato minuteque cristato.

DISTRIBUTION: Venezuela, southeastern part; seen at only one place along small stream near its source, 2100–2400 m. alt.

SPECIMENS EXAMINED:

VENEZUELA: State of Bolivar: upper slopes of Carrao-Tepui, *Steyermark* 60876 (TYPE in Chicago Natural Hist. Museum, †Ill).

Cross-sections of the leaves show upper hypoderm continuous, the fibers large, 20–26 microns in diameter, and reinforced by additional scattered larger fibers; vascular sclereids very abundant above bundle, rare below; auxiliary sclereids lacking in palisade and mesophyll (Plate III, Fig. 3).

8. *Podocarpus magnifolius* n. sp.

Arbor ad 20 m. vel ultra alta, trunco erecto ramis suberectis patentibus; ramulis robustis, alabastris summis magnis, squamis crassis breviter acuminatis; foliis coriaceis erecto-adscendentibus, supra saturate viridibus, late lanceolatis, minoribus interdum oblanceolatis, subtus pallidioribus in ramulis maturis 5–9 cm. longis, 12–17 mm. diametro, interdum ad 17 cm. longis, 24 mm. latis, acutis vel breviter acuminatis; foliis minimis interdum obtusis; folio supra per costam eprofunde canaliculato, canaliculo interdum utrinque marginato, subtus costa obtusa, lamina in petiolum alatum ad 3–5 cm. longo confluyente; strobilis masculis sessilibus, solitariis axillaribus (immaturis tantum visis) squamis plurimis basi insignitis, sporophyllis arctius imbricatis, apice bene evolutis, acuti-obtusis, scariosis, denticulatis.

DISTRIBUTION: In southeastern Venezuela on southeast-facing slopes of Ptari-tepui at 1580–1600 m. altitude and in Bolivia at 850–950 m. altitude; should appear in nearby Brazil.

* Named for Julian A. Steyermark, of the Chicago Museum of Natural History, in recognition of his contributions to the knowledge of plants of Central and South America, especially through his collections from hitherto unknown regions.

SPECIMENS EXAMINED:

VENEZUELA: State of Bolivar: on Ptari-tepui, *Steyermark* 59989 (TYPE in Chic. Nat. Hist. Mus., †Ill); *Steyermark* 60035 (sapling) (†F, Ill).

BOLIVIA: Dept. La Paz: Prov. Larecaja: Copacabana, *Krukoff* 11273 (†A, NY, US). CULTIVATED: Brazil, Jardim Botânico, San Paulo, *Hoehne* 29363 (NY).

Leaf-cross-sections show continuous upper hypoderm, doubled, fibers large, 18–26 microns in diameter; vascular sclereids very abundant both above and below bundle; auxiliary sclereids occasionally present in mesophyll but absent in palisade; epidermal cells 50–70 microns long.

9. *Podocarpus Rusbyi** n. sp.

Podocarpus salicifolius sensu Britton in Bull. Torr. Bot. Club 16: 13. 1889, non Kl. & Karst.

Arbor vel frutex foliis confertis, perulis in alabastris summis longe attenuatis ad 16 mm. longis; foliis coriaceis, lanceolatis, acute acuminatis, 2–3.5 cm. longis, 4–7 mm. latis, per costam bene canaliculatis, ad marginem deminutis, costa subtus bene manifesta ad petiolum carinata; strobilis masculis ignotis; strobilis foemineis pedunculo 3–4 mm. longo fultis, receptaculo 6–7 mm. longo, bracteis in apice divaricatis interdum 2-carpiis; semine ad 7 mm. longe per longitudinem costulato, obtuse cristato (Plate IV, Fig. 1).

DISTRIBUTION: Only in Bolivia, altitude 10,000 ft.

SPECIMENS EXAMINED:

BOLIVIA: Mapiri, *Rusby* 2463, April 1886, (TYPE in †Herb. N. Y. Bot. Gard., GH, Ill, Mich, †Ph, †UC, US-2 sheets); Cocopunco, *Tate* 369 (†NY).

Cross sections of the leaves show continuous upper hypoderm of small fibers, 12–18 microns in diameter; vascular sclereids abundant both above and below bundle on either side of resin canal; auxiliary sclereids few in palisade and mesophyll. Upper epidermal cells 11–22 microns long.

10. *Podocarpus tepuiensis* n. sp.

Arbor 10–15 m. alta trunco ad 30 cm. diametro; alabastris parvis, perulis late triangularibus, apiculatis, 2 mm. longis; foliis dense confertis late lanceolatis, acutis, 1.5–2 cm. longis, 4–5 mm. latis, per costam canaliculatis, costa subtus ad medium inferum proeminente, laminae margine subrevoluto, supra lucidis saturateque viridibus, subtus viridibus, basi cuneatis, sessilibus vel brevissime pedunculatis; strobilis masculis solitariis, axillaribus, sessilibus ad 1 cm. longis, 1.5 mm. crassis; microsporophyllis apice scariosis deflexis; seminibus 7 mm. longis, 4 mm. crassis, cristato-rostratis.

DISTRIBUTION: On forested south-facing sandstone slopes on Mt. Ptari-tepui, 1700–1800 m. altitude, in Venezuela.

SPECIMENS EXAMINED:

VENEZUELA: State of Bolivar: Ptari-tepui, *Steyermark* 59716 (TYPE in Chicago Nat. Hist. Mus., †Ill), *Steyermark* 59715 (F, †Ill).

* Named for Henry H. Rusby who contributed the type specimen of this species. He was formerly Professor of Pharmacognosy at Columbia University, N. Y., and he collected widely in South America, both naming and describing many species.

Cross sections of leaves show continuous upper hypoderm, sometimes doubled, fibers up to 25 microns in diameter; lower hypoderm twice as large as upper; auxiliary and vascular sclereids both absent.

11. *Podocarpus Purdieanus* Hooker, Icon. Pl. pl. 624. 1844; Endlicher Syn. Conif. 210. 1847; Lindley & Gordon in Jour. Hort. Soc. London, 5: 223. 1850; Carrière in Jacques & Herincq, Man. des Pl. 4: 369. 1857, Traité Conif. 446. 1855, ed. 2, 647. 1867; Gordon, Pinetum 281. 1858; Parlato in DC. Prodr. 16(2): 510. 1868; Grisebach, Fl. Brit. West-Ind. Isl. 504. 1861, in part; Fawcett, Econ. Pl. Jamaica 64-65. 1891; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Fawcett, Pl. Jamaica 49. 1893; Dallimore & Jackson, Handb. Conif. 55. 1923, 1931; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 280. 1931.

Podocarpus jamaicensis Hort. in Gordon, Pinetum 281. 1858.

Podocarpus mucronata Hort. in Carrière, Traité Conif. 446. 1855.

A tree up to 40 m. high or higher with trunk diameter up to 1 m. with spreading branches. Twigs moderately short without numerous branchlets. Terminal buds with scales thick below, becoming thin and scarious at margins and with a spine-like apiculus, leaving transverse rhomboidal scars on stem. Leaves subspatulate-lanceolate, coriaceous, shiny above, paler bright green beneath, with a slight groove between ridges or a ridge above (in lower half of leaf) with margin sometimes tending to be revolute and with midrib raised on lower side only near petiole. Leaves of reproductive branches usually 4-9 cm. long, 8-14 mm. wide, with short spine at apex (those of vigorous branches and young plants up to 14 cm. long and 17 mm. wide), sometimes slightly falcate, narrowly acute at apex but sometimes without spine. Leaf cross-sections show continuous upper hypoderm, rarely doubled; vascular sclereids present or absent; auxiliary sclereids absent. Pollen cones solitary, axillary, cylindrical, up to about 15 mm. or more in length. Female cones axillary, on peduncles 2-4 mm. long with receptacle of 2 fused thickened scales nearly equal in length and with carinate spreading triangular tips. Seed oblong, 8 mm. long, 5 mm. wide, with a conical obtuse crest.

DISTRIBUTION: Jamaica, mountains of central and eastern regions at elevations of 2400-3500 ft.

SPECIMENS EXAMINED:

JAMAICA: near Troy, *Harris 8716* (†F, NY, US), *Harris 8828* (†F, NY, US); Mt. Diablo, *Harris 8989* (†F, NY), *Buchholz* in 1946 (Ill); Holly Mount, *Harris 6629* (F, †NY, Ph); Union Hill near Moneague, *Britton & Hollick 2798* (†F, †NY, US); Albert Town, *Anon.* in 1943 (†Ill); locality not given, *Purdie* (†F, †UC).

12. *Podocarpus trinitensis* n. sp.

Podocarpus coriaceus sensu Marshall, Trees Trinidad & Tobago 94. 1934, in part, non. L. C. Rich.

Arbor parva; perulis quam 3 mm. brevioribus, triangularibus attenuatis apiculatisque, alabastris summis globosis; foliis coriaceis lanceolatis vel oblanceolatis apice acutis vel late acutis, interdum obtusis (tum oblanceolatis), ad basem in petiolum alatum coarctatis, supra lucidis, costa manifesta, marginibus leviter subrevolutis subtus laevibus canaliculatis, 3-6 cm. longis, 7-10 mm. latis; strobilis masculis ignotis; strobilis foemineis axillaribus pedunculis ca. 7-8 mm. longis; semine (sicco) 7-8 mm. longo ecristato vel perobscure cristato (Plate IV, Fig. 2), costulis nullis; receptaculo semen longitudine aequante.

DISTRIBUTION: Forests on mountain slopes in Trinidad.

SPECIMENS EXAMINED:

TRINIDAD, B. W. I.: Valencia road, *Broadway 7151*, May 1929, with seeds (TYPE in †Mo. Bot. Gard. Herb., †US); Trurure river forests, *Broadway 7702* (†US); Mt. Tucuche, *Britton, Hazen & Mendelson 1246* (†GH, NY, US).

CULTIVATED: Trinidad, Bot. gardens, *Broadway 7277* (†F, †Mo, US).

Leaf cross-sections show continuous upper hypoderm; vascular sclereids always present above bundle, sometimes below; auxiliary sclereids absent in palisade and mesophyll.

If this entity is the tree described by Marshall under *P. coriaceus*, as seems likely, one may add the following to the description: fairly large tree with trunk often fluted up to 80 cm. in diameter with dark grayish brown bark, fairly smooth, the inner bark pinkish red, fading to almost white. Pollen cones slender, up to 2 cm. long. His description of pollen cones (slender up to $\frac{3}{4}$ in.) is too small. However, there is evidence that *P. coriaceus* actually occurs on Trinidad; if so, only a part of Marshall's description may apply to this species and to the one occurring on Tobago Island.

13. *Podocarpus guatemalensis* Standley in Proc. Biol. Soc. Wash. 37: 49-50. 1924; Pilger in Nat. Pflanzenfam. ed. 2, 13: 247, 1926.

A tree up to 20 m. high with trunk up to 70 cm. in diameter with smooth reddish brown bark, upright habit of growth with spreading crown. Vegetative buds spherical or ovoid with broad ovate bud scales apiculate or obtuse, scarious at margins or not so. Leaves lanceolate, with a distinct ridge at midvein, flat or depressed below midvein, cuneately narrowed near base, angustate toward apex, sometimes falcate, those of lower branches or saplings up to 14 cm. long, 10-12 mm. wide, those of mature reproductive branches usually up to 10 cm. long and less than 10 mm. wide. Cross-sections of leaves show the upper hypoderm to be interrupted and no auxiliary sclereids in palisade or mesophyll; leaves of the species show no vascular sclereids. Pollen cones cylindrical, arising from special buds axillary to leaves or scales of previous year's growth. Seed cones axillary to leaves (formed in year of pollination). Seed on short peduncles up to 4-5 mm. long, receptacles up to 7 mm. long; seeds ellipsoidal up to 8 mm. long (dry) with small conical crests.

The above description is based largely upon mature specimens included under the variety *pinetorum*. There may be some question as to the identity of the plants named *P. guatemalensis* by Standley and *P. pinetorum* by Bartlett. Standley's type specimen is admittedly that of a sapling which may be from seeds derived from near-by British Honduras, where the upland variety is abundant. We find the leaves differing in size as sapling and mature foliage in related species of *Podocarpus* may differ. The vegetative buds of *P. guatemalensis* are ovoid, while those of var. *pinetorum* are usually more spherical. The bud scales of *P. guatemalensis* are ovate and apiculate while those of the var. *pinetorum* are obtuse, broadly acute, sometimes somewhat apiculate or with only a few of the outer scales apiculate (Plate V, Figs. 1 and 2). In leaf anatomy we have found that the leaves of *P. guatemalensis* do not possess vascular

sclereids while those of the upland variety have this character. However, the leaves of the type specimen of *P. guatemalensis* may represent juvenile conditions or leaves of intermediate condition, which might be expected to develop the characteristics of the variety when fully mature. These two entities must evidently be merged in some way and, following the rules of priority, the British Honduras plants become a variety under *P. guatemalensis*.

DISTRIBUTION: In low land at Puerto Barrios, in Guatemala.

SPECIMEN EXAMINED:

GUATEMALA: Dept. Izabal: Puerto Barrios, *Standley 25090* (†US, †GH).

13a. *Podocarpus guatemalensis* var. *pinetorum* (Bart.) n. comb.

Podocarpus pinetorum Bartlett in Publ. Carnegie Inst. Wash. 461: 21. 1935.

Differs from species in having much larger terminal buds with broader, thicker scales. Leaves shorter, narrower, and thicker. Cross-sections of the leaves consistently show vascular sclereids above bundle (Plate VI, Fig. 1). Upper epidermal cells 22–66 microns long, 11–22 microns wide.

DISTRIBUTION: River valleys in coastal ranges of British Honduras.

SPECIMENS EXAMINED:

BRITISH HONDURAS: El Cayo District: Mt. Pine Ridge, *Bartlett 13109* (A, type coll. †Mich, NY, US). Belize District: *Gentle 3452* (A, †F, NY, Mich). Toledo District: Monkey River, *Gentle 3967* (A, †NY, US). Southern District: Stann Creek Valley, *Stocker 18* (†F), *Burns 21* (†F, US); *Gentle 3159* (A, DS, †Mich, NY); *Schipp 969* (A, F, GH, Mich, †Mo, NY, UC). District not given: Temash River, *Kinloch 49* (†F, NY, US), near Middlesex, *Schipp 441* (A, F, CAS, GH, Mich, Mo, NY, UC), *Schipp 444* (A, †F, GH, Mich, Mo, NY, UC); *Schipp* in 1929 (F, †US).

13b. *Podocarpus guatemalensis* var. *Allenii* (Standley) n. comb.

Podocarpus Allenii Standley in Woodson & Schery, Ann. Mo. Bot. Gard. 28: 409. 1941.

Trees 33–36 m. Leaves smaller than species or var. *pinetorum*, 4.2–6.7 cm. long, 7.5–10 mm. wide on mature trees (juvenile foliage 9.5 cm. long, 12–13 mm. wide). Leaf cross sections show vascular sclereids above and below bundle. Upper epidermal cells 11–31 microns long, 8.5–15 microns wide.

DISTRIBUTION: Cerro Campana in Panama; seedlings abundant in cut-over forests.

SPECIMENS EXAMINED:

PANAMA: Prov. Panama: Cerro Campana, *Allen 2437* (†F, Mo), *Allen 2424* (†F seedling). Prov. Cocle: La Mesa, *Allen 2298* (†F); near Bocas del Toro, *Cox* in 1933 (†US).

COSTA RICA: South of Cartago, *Chrysler & Roever* in 1940 (†NJU seedling).

14. *Podocarpus Urbanii* Pilger in Pflanzenreich IV. 5 (Heft 18): 89. 1903; Pilger in Nat. Pflanzenfam. ed. 2, 13: 247. 1926; Dallimore & Jackson, Handb. Conif. 57. 1923, 1931; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 280. 1931.

Podocarpus coriacea Hook. in Lond. Jour. Bot. 1: 656, pl. 9. 1842, non Rich.; Endlicher, Syn. Conif. 210. 1847, in part; Grisebach, Fl. Brit. West-Ind. Isl. 504. 1861, in part; Parlatore in DC. Prodr. 16(2): 509. 1868, in part.

Podocarpus Yacca G. Don in Lond. Hort. Brit. ed. 2, 388. 1832 (nomen), non Don ex Sweet Hort. Brit. ed. 3, 622. 1839.

A small tree seldom more than 10 m. high, with short thickly leafy branchlets. Terminal buds globose with many thin keeled broad obtuse

scales, the outer sometimes minutely apiculate. Leaves stiffly coriaceous, straight, narrowly lanceolate, pungent-apiculate but sometimes only acute or becoming obtuse, gradually narrowed below to a sessile base, 2.5–3.5 cm. long, 4–7 mm. wide. Midvein slightly raised above in lower portion of leaf, marked by a non-stomatiferous stripe, slightly depressed, flat or sometimes raised in stripe-like wrinkles, below. Leaves of seedlings or small shaded branches may exceed 5 cm. Cross-sections of leaves show continuous upper hypoderm, fibers 18 microns in diameter, vascular sclereids occasionally present above; auxiliary sclereids absent. Pollen cones solitary, axillary to leaves of a previous year, sessile, surrounded by numerous thin scarious scales, the outer smaller, carinate and minutely apiculate, cylindrical, 12–15 mm. long, 4 mm. wide. Microsporophylls with upturned apiculus well developed, obtuse and scarious at margins. Female cones of a pair of fused thickened scales forming a receptacle 7 mm. long, the divergent tips triangular, acute, and sharply keeled on peduncles 2–4 mm. long. Seeds ovoid 7 mm. long, 4 mm. wide with a 1 mm. long conical obtuse crest.

DISTRIBUTION: Jamaica, Blue Mountains between 4500 and 7300 ft.

SPECIMENS EXAMINED:

JAMAICA: Cinchona, *Harris* 7798 (†F, NY, Ph), *Harris* 11117 (†F, NY, US), *Harris* 8305 (†F, NY), *Harris* 8490 (NY), *Harris* 8489 (NY), *Harris* 9199 (A), *Harris & Lawrence* C15253 (†US), *Britton* 130 (NY), *Hart* 1086 (US), *Buchholz* in 1946 (Ill); Blue Mountain, *Bancroft & Miller* 17 (US), *Hart* s.n. (†F), *Hunnewell & Griscom* 14107 (GH), *Chrysler* 2038 (NJU, Penn), *Sargent* in 1885 (†A), *Maxon* 1440 (US), *Alexander* (?) 274 in 1850 (†NY), *Anon.* in 1943 (Ill); Morce's Gap, *Rehder* in 1903 (A, NY), *Buchholz* in 1946 (Ill), *Purdie* in 1844 (NY), *Alexander* in 1850 (NY); Mossman's Peak, *Maxon* 9784 (GH, US).

15. *Podocarpus pendulifolius* n. sp.

Arbor parva 6–7 m. alta (fide Steyermark: monoica); ramulis crassis, alabastris magnis globulosis; perulis late ovatis, saepius obtusis scariosisque, carinatis; foliis dependentibus, percoriaceis pallide viridibus, lucidissimis, arctius lanceolatis, falcatis, in ramulis robustis sublinearibus, acuminatis, applanatis vel bisulcatis; laminae margine laevi, incrassato haud revoluti; strobilis masculis ex alabastris lateralibus sessilibus, perulis numerosis late ovatis, cylindricis ad 2 cm. vel ultra longis, 6–7 mm. crassis; microsporophyllis apice bene dilatatis, obtusis, scariosis denticulatis; strobilis foemineis axillaribus pedunculis 7–10 mm. longis fultis; receptaculo glauco semen longitudine aequante; semine viridi glauco, globoso vel subturbinato, crista minima obtusa.

DISTRIBUTION: In dwarfed forests on slopes in Western Venezuela, altitude 1800–3000 meters.

SPECIMENS EXAMINED:

VENEZUELA: State of Tachira: dwarfed forest on slopes below Páramo de la Negra above La Grita, *J. A. Steyermark* 57115, July 7, 1944 (TYPE in †Herb. Univ. Ill., F), *Steyermark* 57113 (F, †Ill), *Steyermark* 57114 (F, †Ill). State of Merida: between La Cumbre, San Jose and Mucutuy, *Steyermark* 56238 (†F).

Leaf cross-sections show upper hypoderm continuous, often doubled and reinforced by larger fibers; vascular sclereids present above and below bundle; auxiliary sclereids rare in palisade but abundant in mesophyll. The margin of the leaf is much swollen or thickened (Plate VI, Fig. 2).

16. *Podocarpus oleifolius* D. Don in Lambert, *Pinus* 2: 20. 1824, ed. 2, 2: 121. 1828; Endlicher, *Syn. Conif.* 209. 1847; Carrière, *Traité Conif.* 645. 1867; Parlato in DC. *Prodr.* 16(2): 510. 1868; Pilger in *Pflanzenreich* IV. 5 (Heft 18): 87. 1903; Weberbauer in *Veg. der Erde* 12: 74. 1911; Herzog in *Veg. der Erde* 15: 161. 1923; Dallimore & Jackson, *Handb. Conif.* 54. 1923, 1931; Florin in *Svenska Vet.-Akad. Handl. ser. 3.* 10(1): 280. 1931; Rimbach, *Trop. Woods* 31: 3. 1932, *Flora* (Quito, Ecuador) 2: 119. 1942; Macbride, *Flora of Peru*, 1 (Field Mus. Nat. Hist. Publ. 351, Bot. Ser. 13): 84. 1936; Standley, *Flora Costa Rica*, Field Mus. Nat. Hist. Publ. 391, Bot. Ser. 18: 64. 1937.

A tree up to 20 m. high with yellowish brown bark, the branches and leaves crowded. Vegetative buds globose; the bud scales rounded or broadly ovate, obtuse and scarious margined (Plate VI, Fig. 3). Leaves stiffly coriaceous, lanceolate-angustate, gradually narrowed toward tip, narrowly acute and subsessile at base, 2.5–8 cm. long, 5–12 mm. wide, (those of sprouts, saplings or vigorous shoots up to 15 cm. long and 20 mm. wide), with a well-marked narrow groove above the midvein, broad but not very prominent underneath. Cross-sections of leaves show continuous upper hypoderm, reinforced by larger fibers, lower hypoderm fibers larger than upper; vascular sclereids usually present, often abundant; auxiliary sclereids usually present, often very abundant in both palisade and mesophyll. Pollen cones solitary, axillary, 3 cm. long, 3 mm. wide (expanded), arising from sessile buds of previous year's growth surrounded by thick rounded carinate scales. Microsporophylls tipped with upturned rotundate apiculus. Female cones solitary, axillary, on peduncles 5–10 mm. long, receptacle of 2 fused fleshy scales free at tip, 6–9 mm. long. Seed globose-ovoid with a suppressed crest, 7–8 mm. long.

DISTRIBUTION: From southern Mexico (Chiapas and Oaxaca) to northern Peru and Bolivia, at elevations 2000–2800 m. with a variety extending eastward into Venezuela.

SPECIMENS EXAMINED:

MEXICO: Oaxaca: "Petlapa" (Petalpa) *Liebmann* 14822 (†F); near Reforma, *Xolocotzi & Sharp* 46236 (†Ill, Tenn).

GUATEMALA: Zacapa: *Steyermark* 42573 (†F), *Steyermark* 42801 (†F-2 sheets), *Steyermark* 43266 (†F); Sierra de Minas, *Sharp* 45248 (†Ill, Tenn).

EL SALVADOR: Chalatenango, Los Esmiles, *Tucker* 1034 (†UC).

COSTA RICA: Prov. Alajuela: Poas, *Smith* 6856 (†F, GH, Mo, NY, US-2 sheets). Prov. San Jose: *Standley* 42142 (US); *Standley* 42993 (US); La Palma de San Ramon, *Brenes* 3840 (F), *Brenes* 6230 (F), *Brenes* 5653 (†F), *Brenes* 6378 (†F), *Quiros* 272 (F); Cerro Jucosal, *Stork* 1120 (F, Mich); Cartago, *Standley & Torres* 51768 (US), *Standley* 33914 (F, US); south of Cartago, *Stork* 401 (†US), *Stork* 366 (†US), *Chrysler & Roeper* 5440 (†NJU), *Chrysler & Roeper* 5454 (NJU); Volcan de la Vieja, *Brenes* 15554 (F); Poas, *Standley* 34640 (US, F), *Greenman & Greenman* 5375 (†Mo), *Tonduz* 10744 (US), *Pittier* 2052 (GH, †US); El Copey, *Tonduz* 11717 (US-2 sheets), *Stork* 1541 (F), *Stork* 1560 (F, Mich).

COLOMBIA: Santander: Cordillera Oriental, *Cuatrecasas, Schultes & Smith* 12429 (†US). Santa Marta: *Espina & Giacometo* A172 (†F, NY, US-2 sheets); Comisaria del Putumayo, *Cuatrecasas* 11840 (†US).

ECUADOR: Huigra, *Rose & Rose* 23841 (GH, NY, †US); Prov. Azuay, *Steyermark* 52605 (F, †Ill), *Steyermark* 53348 (F, †Ill), *Steyermark* 53431 (F, †Ill); El Oro: *Steyermark* 53906 (F, †Ill); Loja: *Steyermark* 54781 (F, †Ill); Corazon: *Andre* 3930 (†NY).

PERU: Pillao, *Ruiz & Pavon* in 1778–1788 (ex Herb. Horti Bot. Matritensis) (†F); *Pavon* ex Berlin Herb. (photo 11576) (F, GH); Tatanara, *Lechler* 2574 (ex Berlin) (F); Dept. Cajamarca: Cutervo, *Stork & Horton* 10138 (†F, UC); Dept. San Martin: *Siebert* 2084 (†Ill, US); *Weberbauer* 4090 (ex Berlin Herb) (F).

16a. *Podocarpus oleifolius* var. *macrostachyus* (Parl.) n. comb.

Podocarpus macrostachyus Parlature in DC. Prodr. 16(2): 510. 1868; Pilger in Pflanzenreich IV. 5 (Heft 18): 87. 1903; Pilger in Nat. Pflanzenfam. ed. 2, 13: 247. 1926; Dallimore & Jackson, Handb. Conif. 50. 1923, 1931; Pittier in Bol. Cient. Tecn. Mus. Com. Venezuela 1: 9. 1927; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931; Schnee in Bol. Soc. Venezol. Cienc. Nat. 9: 185, fig. 4. 1944.

A tree up to 15 m. tall with leaves crowded on much branched twigs. Terminal buds spherical, scales thick, ovate, obtuse with scarious margins. Leaves crowded, spreading, somewhat shiny, dark green above, paler dull green beneath, very stiffly coriaceous, elliptical, short oblanceolate, obtuse, gradually narrowed to a short petiole, 2–5 cm. long, 7–12 mm. wide, with a distinct groove above the midvein, a ridge beneath. Pollen cones on peduncles 3–5 mm. long, arising from buds in the axils of leaves of previous year, cylindrical 2.5–3 cm. long, about 3–4 mm. in diameter, with many thick obtuse carinate scales at base of cone. Microsporophylls with obtuse upturned scarious apiculus. Female cones axillary on peduncles about 5 mm. long; receptacle fleshy, about 11 mm. long, of 2 scales free at obtuse tip. Ovules 1–2. Seeds ovoid, 10–12 mm. long, 5–6 mm. wide, distinctly crested at apex, the outer seed coat coriaceous.

This tree was originally described by Parlature as from Colombia, whereas the first specimen he cited, *Fendler 1287* (technically the type) was actually collected in Venezuela near Colonia Tovar (now Tovar in Aragua, not Tovar in Merida of western Venezuela). Pilger repeats this error in citing Merida (western Venezuela) for the Fendler collection though he lists the *Moritz 1677* collection from Colonia Tovar. We have not seen the *Funk & Schlimm 16316* specimen from Merida, but a more recent one, collected by Steyermark, comes from this region. Nevertheless the type locality is in the coastal mountains north of Caracas. This variety occurs also through northern Colombia to Panama, but another variety of *P. oleifolius* is also found there with longer leaves. In Costa Rica *P. oleifolius* var. *costaricensis* has more pointed leaves, acute, with smaller seeds, but the pollen cones are similarly peduncled as in this variety.

DISTRIBUTION: Among dwarfed trees and shrubs at 1850–3050 meters altitude in Venezuela and Colombia.

SPECIMENS EXAMINED:

VENEZUELA: Federal District: El Junquito, *Steyermark 56968* (†F, Ill), *Steyermark 56967* (F, †Ill), *Schnee 32* (†Ill, Ven). Aragua District: Coloniam Tovar, *Fendler 1287* (ISOTYPE, GH, Mo, †NY, †Ph), *Moritz 1677* (†F, GH), *Pittier 9989* (US). State of Merida: Paramo above San Isidro Alto, *Steyermark 56552* (F, †Ill). State of Tachira: Paramo de la Negra above La Grita, *Steyermark 57085* (†F, Ill).

COLOMBIA: Dept. Antioquia: San Antonia, *Daniels 462* (†US). Province not given: Murillo, *Dawe 760* (NY, †US), *Purdie* (ex Bentham Herb.) (†GH, NY); *Triana 2* (ex Herb. Nat. Col.) (F, GH, NY, US).

16b. *Podocarpus oleifolius* var. *costaricensis* nov. var.

Podocarpus macrostachyus Pilger in Pflanzenreich IV. 5 (Heft 18): 87. 1903, in part.

Arbores inter *P. oleifolium* atque *P. oleifolium* var. *macrostachyum*

medium tenentes; perulis alabastrorum summorum, illis specierum supra laudatarum persimilibus; foliis saepius ad *P. oleifolium* var. *macrostachyum* accedentibus at magnis acutis; strobilis masculis pedunculo 3–6 mm. praeditis ut in *P. oleifolio* var. *macrostachyo*, at seminibus minoribus *P. oleifolii* mentientibus.

DISTRIBUTION: In Costa Rica, 1700–2800 m. on Volcan Poas.

SPECIMENS EXAMINED:

COSTA RICA: Dept. Alajuela: Volcan Poas, Potiero del Alto, *H. Pittier* 822 (TYPE in †U.S. Nat. Herb.), *Pittier & Durand* 363 (†US), *Valerio* 1627 (F), *Valerio* 1628 (†F), *Cooper* 10322 (†US); *Stork* 2519 (F), *Jimenez* 1008 (†US).

PANAMA: *Sutton Hayes* 749 (†NY).

16c. *Podocarpus oleifolius* var. *trujillensis* nov. var.

Varietas medium inter *P. oleifolium* atque *P. oleifolium* var. *macrostachyum* tenens, perulis in alabastris summis gracilioribus magisque carinatis; foliis per costam canaliculatis, saepius apice quam in speciebus laudatis latoribus, quam *P. oleifolii* magis obtusis, *P. oleifolii* var. *macrostachyi* longioribus; strobilis masculis ignotis; seminibus ad *P. oleifolii* var. *macrostachyi* accedentibus, pedunculo 10–18 mm. longo, receptaculo squamis carnosus, bracteis semina alte amplexantibus donato, 11–12 mm. longo.

DISTRIBUTION: Venezuela in states of Trujillo, Merida and Lara at 2300–3200 m. in cloud forests.

SPECIMENS EXAMINED:

VENEZUELA: State of Trujillo: *Steyermark* 55335 (type in Herb. Chicago Nat. Hist. Mus., †Ill); Merida: *Gehriger* 469 (A, F, NY, PH, †US, Ven), above Tabay, *Steyermark* 56587 (F, †Ill); Lara: *Steyermark* 55222 (F, †Ill).

17. *Podocarpus glomeratus* D. Don in Lambert, *Pinus* 2: 21. 1824, ed. 2, 2: 121. 1828; Gordon, *Pinetum* 337. 1875; Parlatore in DC. *Prodr.* 16(2): 513. 1868; Pilger in *Pflanzenreich* IV. 5(Heft 18): 86. 1903; Pilger in *Nat. Pflanzenfam.* ed. 2, 13: 247. 1926, in part; Dallimore & Jackson, *Handb. Conif.* 46. 1923, 1931, in part; Florin in *Svenska Vet.-Akad. Handl. ser. 3*, 10(1): 279. 1931, in part.

Juniperus rigida Pavon *Mss.* ex Endlicher, *Syn. Conif.* 211. 1847.

Podocarpus rigida Klotzsch ex Endlicher, *Syn. Conif.* 211. 1847; Carrière, *Traité Conif.* ed. 2, 649. 1867.

A tree up to 12 m. high, but often dwarfed and shrubby, with dark brown bark and crowded foliage on numerous verticillate branches. Buds of vegetative branches sub-globose with scales ovate or broadly lanceolate-acuminate not over 7 mm. long, the outermost scales sometimes foliaceous. Leaves erect or sub-patent, stiffly coriaceous, straight, or sub-falcate, linear-lanceolate, light grayish green and shiny above, very glaucous beneath, angustate and narrowly acuminate at the tip ending in a stiff pungent prickle, narrowed at the base into a very short petiole, 2–5 cm. long, 2–4 mm. wide, with an open groove above the midvein and the margin turning down. Cross-sections of leaves show continuous hypoderm. Pollen cones fascicled, about 6 per cluster on slender peduncles 8–12 mm. long, with small awl-shaped 1–2 mm. long bracts, the cylindrical cones usually about 1.5 mm. in diameter, up to 6 mm. long, the sporophyll with deltoid, scarious denticulate apex. Ovulate cones sessile or on peduncles up to 4 mm. long, receptacle 5–6 mm. long, crestless or with very minute crest.

DISTRIBUTION: 2500–4000 meters on inland cordilleras of Peru and southern Ecuador.

SPECIMENS EXAMINED:

PERU: Huanuco: Panao, *Macbride* 3630 (topotype, A, †F), *Woytkowski* 113 (F). Junin: *Weberbauer* 6586 (F, GH, US). Apurimac: Abancay, *Vargas* 509 April 1938, (CAS, GH), *Vargas & Santander* 509 August 1937, (†F), *West* 3816 (GH, †UC), *Stork, Horton & Vargas* 10620 (A, †UC). Cuzco: Torontoy, *Cook & Gilbert* 835 (US), *Bingham* 732 (US).

ECUADOR: Prov. Azuay: *Steyermark* 53023 (F, Ill).

18. *Podocarpus Cardenasii** n. sp.

Arbor ad 10 m. alta trunco ad 80 cm. diametro, habitu compacta ramulis ultimis saepius verticillatis; perulis in alabastris vegetativis lanceolatis, acuminato-apiculatis subreflexis, margine deorsum minute denticulatis; foliis divaricatum patentibus lineari-lanceolatis, pallide viridibus applanatis, subtus glaucescentibus, margine laminae subrevoluto, apice mucrone spinuloso pungente terminatis, deorsum in petiolum alatum confluentibus 1.5–3 cm. longis, 2–3 mm. latis; strobilis masculis fasciculatis, ad 6–8 in fasciculo, pedunculis gracilibus eramosis 10–15 mm. longis fultis (Plate VII, Fig. 1), cylindricis ad 6 mm. longis, 1.5 mm. crassis, sporophyllis apiculo parvo rhombeo scarioso terminatis; bracteis sub amento lanceolato-acuminatis ad 2.5 mm. longis; strobilis foemineis ignotis.

DISTRIBUTION: In Bolivia, Sailapata in Ayopaya, Cochabamba.

SPECIMENS EXAMINED:

BOLIVIA: Cochabamba: Ayopaya: Sailapata, 2700 m., *Cardenas* 3053 (TYPE in †U.S. Nat. Herb., A).

Cross-sections of leaves show upper hypoderm interrupted; vascular and auxiliary sclereids absent.

19. *Podocarpus Parlatorei* Pilger in *Pflanzenreich* IV. 5 (Heft 18): 86. 1903; Pilger in *Nat. Pflanzenfam.* ed. 2, 13: 247. 1926; Lillo, *Contr. Arboles Argent.* 20. 1910; Herzog in *Veg. der Erde* 15: 151, 159, 165. 1923; Florin in *Svenska Vet.-Akad. Handl.* ser. 3, 10(1): 280. 1931; Covas, *Revista Argentina Agron.* 6: 26. 1939.

Podocarpus angustifolia Parlatore in DC. *Prodr.* 16(2): 512. 1868, non Grisebach.

A shrub or tree up to 10 m. tall with trunk up to 70 cm. in diameter with brown, somewhat fissured bark, branching from near the ground, having numerous sub-verticillate branchlets. Terminal buds spherical with scales carinate, acuminate, or long apiculate. Leaves thin coriaceous, scattered, fairly erect to patent, narrowly linear, gradually angustate to the spine at tip, narrowing at base to a short broad petiole, 3–8 cm. long, 2–4 mm. wide, mature leaves with revolute margin and with upper surface flat or with an open shallow groove; a narrow ridge at midvein on lower surface. Cross-sections of leaves show continuous upper hypoderm. Pollen cones 3–6 fascicled on angular peduncles 6–15 mm. long or with more than this number of cones per peduncle due to cymose branching near the top. Bracts beneath cones lanceolate, 2 mm. long, followed by numerous broadly ovate apiculate scales. Microsporophylls with an evident triangular upturned apiculus. Female cones on peduncles 5–10 mm. long, appearing with new foliage, solitary in axillary position; receptacle 3–4 mm. long of about 3 fused scales bearing a single ovule (seldom 2) with

* Named in honor of Martin Cárdenas, one of the most well-known of the South American botanists, who, working at the Simón Bolívar University, Cochabamba, Bolivia, is directing research, collecting, and is active in numerous projects furthering botany in South America.

the free upper end of the fertile bract very short and membranous. Seed spherical 5–6 mm. long, 4–5 mm. wide, with a very blunt, inconspicuous crest. Pollination in mid-November at 700 m. near Tucuman.

DISTRIBUTION: Southern Peru, Bolivia and northern Argentina at elevations from 1700–3000 m.

SPECIMENS EXAMINED:

PERU: Torontoy, *Cook & Gilbert 1188* (US).

BOLIVIA: Cochabamba: *Steinbach 6025* (A, F). Tarija: *Cardenas 133* (GH); Rincon de la Victoria, *West 8417* (GH, †Mo, UC). Tomina: *Carriker in 1937* (Ph). Province unknown: Sierra de la Cruz, *Kuntze 92* (NY-2 sheets), *Fiebrig 3569* (ex Berlin Herb.) (F).

ARGENTINA: Prov. Tucuman: El Saladillo, *Jorgeson 82* (GH, †Mo, US); Tañi, *Wetmore 912* (US), *Venturi 9811* (A, †Mo, US), *Venturi 9246* (US); Chicligasta, *Venturi 4594* (A, -CAS, †F, GH, Mo, UC, US), *Venturi 2978* (US); Burroayao, *Venturi 7725* (CAS, GH-2 sheets, †Mo, US). Prov. de Salta: Quachipas, *Venturi 9811* (GH); Candelaria, *Venturi 8753* (US, A).

20. *Podocarpus salignus* D. Don in Lambert, *Pinus* 2: 20. 1824, ed. 2, 2: 120. 1828; Pilger in *Pflanzenreich* IV. 5 (Heft 18): 82. 1903; Pilger in *Nat. Pflanzenfam.* ed. 2, 13: 247. 1926; Bailey, *Cult. Conif.* 33. 1933; Florin in *Svenska Vet.-Akad. Handl.* ser. 3, 10(1): 280. 1931.

Podocarpus chilinus L. C. Rich. in *Ann. Mus. Hist. Nat. Paris* 16: 297. 1810 (nomen), *Comm. Conif.* 11, pl. 1, fig. 1. 1826; Endlicher, *Syn. Conif.* 212. 1847; Gay, *Fl. Chilena* 5: 402. "1849" (1852); Gordon, *Pinetum* 270. 1858, ed. 2, 329. 1875; Carrière, *Traité Conif.* 2: 649. 1867; Parlato in *DC. Prodr.* 16(2): 511. 1868; Neger in *Bot. Jahrb.* 23: 403. 1896; Worsdell, *Trans. Linn. Soc. London*, ser. 2, 5: 301. 1897; Van Tieghem in *Bull. Soc. Bot. France* 38: 169. 1891; Reiche, *Veg. der Erde* 8: 63–64. Leipzig 1907; Dallimore & Jackson, *Handb. Conif.* 40. 1923, 1931.

A much branched tree up to 20 m. high, twigs slender, their terminal buds small, ovoid, scales long attenuate or less often distinctly apiculate. Leaves spreading, linear lanceolate, sometimes falcate, long angustate toward apex, tapering below to a short petiole (several mm. long), 6–12 cm. long, 3–8 mm. wide with a narrow ridge above midvein, less distinct or drying wrinkled and flat below. Leaf cross-sections show the upper hypoderm interrupted. Pollen cones axillary to scales and closely aggregated near tips of twigs or axillary to leaves and more scattered, linear filiform cylindrical 2–3.5 cm. long, 1–1.5 mm. wide, with microsporophylls devoid of an apiculus. Seed cones solitary, axillary on slender peduncles, 8–20 mm. long, receptacle about 6–8 mm. long, bearing 1–2 ovules, of 2–3 fused scales with small tips, the upper part becoming abruptly divergent when 2 seeds develop. Seeds oblong with a prominent blunt crest, 7–8 mm. long and 3–3.5 mm. wide.

DISTRIBUTION: Mountains of central and southern Chile, up to 900 m. Frequently cultivated.

SPECIMENS EXAMINED:

CHILE: Maule: Cordillera de Maule, *Gay* (ex Herb. Mus. Paris) (GH, US). Coronel: *Ochsenius* in 1862 (GH, †Mo). Prov. Nuble: Recinto, *Pennell 12491* (GH, F, †NY, Ph). Concepcion: *Looser 3270* (GH). Prov. Malleco: Pailahueque, *Joseph 4860* (US), *Joseph 4935* (US); *Pirion 212* (GH); Puren, *Bohn* in 1919 (F); Ercilla, *Kuntze 92* (NY-2 sheets); Panquipulli, *Joseph 2577* (US), *Joseph 2409* (US). Cautin: Near Temuco, *Sargent* in 1906 (A, Mo). Valdivia: Coral, *Krause* s.n. (†US); *Junge 429* (Mo), *Gunckel 46* (F), *Anon.* in 1908 (Mo);

San Juan, *Anon.* in 1900 (A), *Anon.* in 1872 (GH); Quitaluto, *Gunckel* 899.3 (UC); Osorno, *Morrison* 17658 (GH, UC); La Union, *Bohn* 1111 (A, Mo); *Philippi* in 1888 (US), *Philippi* in 1863 (A, F, NY), *Werdermann* 354 (A, CAS, GH, F, Mo, †NY, UC, US), *Werdermann* 353 (CAS, F, GH, Mo, NY, UC, US), *Hollermayer* 306 (NY), *Buchtien* in 1896 (GH, US), *Buchtien* in 1898 (A), *Lerchler* 467 (GH). Province not given: Austro-Andina, *Poeppig* (†F, †Mo), *Anon.* (ex Herb. Mus. Paris) (NY), *Bean* in 1912 (A), *Bridges* (NY).

CULTIVATED: Kew: *Nicholson* 64 (A), *Nicholson* 71 (A); Windsor Park, *Parker* in 1903 (A). California: Golden Gate Park, *Buchholz* in 1942 (Ill), *Eastwood* in 1916 (CAS), *Walther* in 1920 (A), *Walther* in 1923 (CAS), *Walther* in 1924 (A), *Walther* 152 (CAS, NY); *Anon.* (ex Gordon Herb.) (A).

21. *Podocarpus Sprucei* Parlato in DC. Prodr. 16(2): 510. 1868; Gordon, Pinetum 348. 1875.

Podocarpus glomeratus Pilger in Pflanzenreich IV. 5 (Heft 18): 86. 1903, in part, non D. Don; Pilger in Nat. Pflanzenfam. ed. 2, 13: 247. 1926, in part; Dallimore & Jackson, Handb. Conif. 46: 1931, in part; sensu Diels in Bibliotheca Bot. (Heft 29) 116: 57. 1937; sensu Rimbach in Flora (Quito, Ecuador) 2: 119. 1942 non D. Don; Rimbach, Tropical Woods 31: 3. 1932.

A tree up to 10 m. high (often dwarfed to a shrub at high altitudes) with reddish brown bark longitudinally furrowed and with numerous leaves crowded on sub-verticillate branches. Terminal vegetative buds relatively large, globose with coriaceous carinate scales, the outer lanceolate, apiculate or short-acute, the inner ovate, acute or obtuse scales, both kinds with scarious denticulate margins. Leaves erect to sub-patent, stiffly coriaceous, straight or sub-falcate, linear elliptical or linear-lanceolate, glossy dark green, some with shallow open groove above, others with a low ridge above midvein, paler and striate bluish green lower surface, usually shortly angustate at tip. Leaves near ends of twigs sometimes pungent, those belonging to early leaves of a growth cycle may be broadly acute or obtuse without a prickle. Leaves gradually narrowed at base to a short petiole or sub-sessile, about 2.5–4 cm. long, 3–5.5 mm. wide (up to 7 cm. long on vigorous lower branches or saplings), the margins usually slightly revolute. Leaf cross-sections show interrupted hypoderm, vascular and auxiliary sclereids absent. Pollen cones (Plate VII, Fig. 3) fascicled in groups of 6–10 or more on stout axillary 15–25 mm. long peduncles, the peduncles usually scaly or leafy and corymbosely branched above, cylindrical, 2–2.5 mm. in diameter, up to 10 mm. long, subtending bracts 5 mm. long, the sporophyll with a broadly obtuse scarious apex. Occasional pollen cones may also be found axillary, solitary and sub-sessile. Ovulate cones (Plate VII, Fig. 2) on axillary peduncles 3–7 mm. long, receptacle 6–7 mm. long. Seeds sub-globose 7–8 mm. long, minutely crested with a ridge along side.

While *P. Sprucei* Parl. was placed as a synonym under *P. glomeratus* by Pilger with his description broadened to include both species, we have become convinced that these are different species and should be treated as such. It is not so easy to separate them on the basis of single characters because both of them vary considerably, yet when all differences are considered they do stand apart.

Podocarpus Sprucei is not glaucous on the lower side of the leaf, whereas *P. glomeratus* is normally very glaucous. It has wider leaves, many of them obtuse or broadly obtuse without the prickle. The pollen cones

differ as may be seen in the descriptions, are larger in *P. Sprucei*, more numerous per cluster and have much longer bracts subtending the outer cones. The seeds of *P. Sprucei* are larger, on longer peduncles.

It is likely that for both species several varieties may become recognizable. The cultivated specimens represented by *Rose & Rose 22307* show the longest leaves.

DISTRIBUTION: In Ecuador, central and western cordillera from Chimborazo north into Colombia.

SPECIMENS EXAMINED:

ECUADOR: Parama de Naba, *Spruce 5519* (ISOTYPE, †F, GH); Andes west of Cuenca, *Lehmann 4812* (†F); Chimborazo, *André 139* (F, GH, NY); *André 3937* (F, GH, NY, †US); Western Cordillera, Rio Chimbo, *Rimbach 626* (†F, NY, US); central Ecuador, *André 138* (F, GH, NY); locality not given, *Mutis 637* (probably collected in Ecuador by Caldas) (US).

CULTIVATED: Ecuador: vicinity of Huigra, *Rose & Rose 22307* (F, NY, GH, US).

22. *Podocarpus Lambertii* Klotzsch in Endlicher, Syn. Conif. 211, 1847; Eichler in Fl. Brasil 4(1): 432, pl. 115. 1863; Carrière, Traité Conif. 648. 1867; Parlato in DC. Prodr. 16(2): 512. 1868; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Pilger in Pflanzenreich IV. 5 (Heft 18): 86. 1903; Dallimore & Jackson, Handb. Conif. 48. 1923, 1931; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931.

Podocarpus angustifolius Niederl. in Hauman & Vanderv. Mus. Nat. Buenos Aires 29: 7. 1917, non Parl.

A large tree with numerous branches and branchlets, sub-verticillate with crowded foliage. Terminal buds spherical, scales broadly ovate, obtuse, with thin scarious margins (outer bud scales of 2-year-old seedling apiculate). Leaves erect to patent, linear, obtuse, or acute, and pungent, shiny, either flat or with midrib obscure or with open groove above, dull beneath, with a broad ridge below midvein, up to 3–4 cm. long, 2–3 mm. wide. Sections of leaves show continuous hypoderm, no vascular nor auxiliary sclereids. Pollen cones numerous, 3–6 at tip of naked axillary peduncle, those of *Glaziou 7852* 5 mm. long (10–15 mm. long, 2.5 mm. wide on a cultivated plant *Hoehne 14484*). Female cones solitary on peduncles 5–8 mm. long; receptacle about 4 mm. long, of a pair of fused scales, with free scale.

SPECIMENS EXAMINED:

BRAZIL: Minas: Morro Cavado, *Glaziou 7852* (†F, US); *Sellow* (ex Herb. Mus. Hist. Nat. Vindob.) (†F); Campos do Jordao, *Harshberger 934* (Penn, †US); San Paulo, *Netto 4432* (US).

CULTIVATED: Brazil: San Paulo, Ypiranga Horto do Mus. *Hoehne 4628* (NY).

- 22a. *Podocarpus Lambertii* var. *transiens* Pilger in Pflanzenreich IV. 5 (Heft 18): 86. 1903.

This plant differs from species in having a few of outer terminal bud scales apiculate, its linear-lanceolate leaves 2.5–5 cm. long, 3.5–5 mm. wide, with more broadly acute or obtuse tips, not pungent or scarcely sharp pointed. Pollen cones (based upon a cultivated specimen, *Luederwaldt 14844*, with longer leaves and some of them pungent) numerous, 3–6 at tip of peduncles 10–14 mm. long, cylindrical, 10–15 mm. long, 2.5 mm. wide.

SPECIMENS EXAMINED:

BRAZIL: Serra de San Jose, *Glaziou 16335* (GH, NY, †US); *Glaziou 17779* (†F); Serra do Cipó, *Barreto & Brade 1145* (†F).

CULTIVATED: Brazil: San Paulo, Ypirango Horto ex Mus. Paulista 6431, *Luederwaldt 14484* (A).

23. *Podocarpus Leonii* Carabia in Caribbean Forester 2: 92. 1941.

An arborescent shrub or small tree 6–7 m. high. Terminal buds ovoid with scales arising from a broad base, thin at margins, carinate and long apiculate. Twigs densely leafy, with leaves crowded when on short shoots (internodes 2–6 mm. on longer shoot with internodes more than 1 cm.). Leaves patent to more spreading, coriaceous, straight or seldom falcate, elliptical, tending toward oblanceolate, acute and pungent apiculate, narrowed below into a very short petiole, 2–5 cm. long, 5–10 mm. wide with midvein flat or scarcely at all impressed above and narrowly prominent below. Pollen cones unknown. Female cones solitary, axillary, on peduncles 4–5 mm. long, with upper free ends triangular. Seed ovoid, 8 mm. long, 4 mm. wide, with a distinct 1 mm. long conical crest.

DISTRIBUTION: In eastern Cuba, Oriente, Sierra de Imas, Purton del Mote, at 500 m. elevations.

SPECIMENS EXAMINED:

CUBA: *Leon 12192* (type coll. †NY), *Leon 12193* (†NY); *Shafer 8785* (†NY).

This entity resembles a previously described variety, *P. Buchii* var. *latifolius*, from nearby Haiti. However, the latter has slightly longer peduncles and somewhat longer leaves than this type specimen of *P. Leonii*. There may be other differences. The differences among the Cuban and Haitian species seem to have the value of varieties rather than species. However, there are available, thus far, so few specimens from Haiti and Cuba that we do not feel justified in placing these in synonymy. One might suggest that in this region there are species in the making that deserve most careful study from numerous collections in several localities of both islands — differences that may have arisen since the separation of these mountain masses by the Windward Passage.

24. *Podocarpus Victorinianus* Carabia in Caribbean Forester 2: 92–93. 1941.

An arborescent shrub, many-branched, the branches lax. Terminal buds ovoid with long apiculate, erect or spreading scales arising from a broad base, carinate and scarious at margins. Leaves lax, straight or very slightly falcate, elliptical, 3–5 cm. long, 10–13 mm. wide, acute and pungent-apiculate at tip, narrowed into a short petiole below, essentially flat above and below with ridge at midvein only near base. Pollen cones unknown. Female cones on peduncle of unknown length; receptacle of a pair of fused scales with free apices obtuse, becoming very fleshy, 15 mm. long and 10 mm. wide. Seed single, 10 mm. long, 5 mm. wide with a conical curved or oblique 2 mm. long crest.

DISTRIBUTION: Only collection from Monte Verde, Oriente, in Eastern Cuba.

SPECIMEN EXAMINED:

CUBA: Oriente, Monte Verde, *Wright 1461* mounted on left half of sheet bearing a specimen of *P. aristulatus*, also *Wright 1461* (†GH).

25. *Podocarpus angustifolius* Grisebach in Cat. Pl. Cubensis 217. 1866; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Pilger in Pflanzenreich IV. 5 (Heft 18): 89. 1903, excl. syn.; Dallimore & Jackson, Handb. Conif. 39. 1923, 1931, excl. syn.; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931; Florin in Arkiv. Bot. 25A(5): 2. 1934, excl. *P. aristulata* Parl.; Carabia in Caribbean Forester 2: 92, 1941.

An arborescent shrub with sub-verticillate branches and spreading foliage. Buds spherical or ovoid with broad carinate scales bearing long slender apiculus. Leaves linear, patent, sub-coriaceous, narrowed toward apex ending in a spine, on upper side with a slight ridge above midvein, revolute at margin when mature, with a narrow ridge at midvein on lower side, narrowed near base into a short petiole, 4–7 mm. long, 3–4.5 mm. wide. Pollen cones axillary to leaves of previous year's growth, sessile, cylindrical, 10–15 mm. long, 3 mm. wide, the microsporophylls with upturned broadly obtuse, scariously dentate tips. Ovulate cones on peduncles 2.5 to 4.5 mm. long, receptacle of a pair of scales connate below, unequal, spreading and obtuse above, becoming fleshy. Seed 7 mm. long, crested.

DISTRIBUTION: Only collections from western Cuba, on Pinar del Rio, Sierra del Organos, El Retiro Gripo de Rosario, San Diego de Tapia and San Miguel (Carabia).

SPECIMEN EXAMINED:

CUBA: *Wright 3188* (fragment ex Gottingen Herb., †GH, †Mo, NY, US, YU).

26. *Podocarpus aristulatus* Parlatores in DC. Prodr. 16(2): 513. 1868; Carabia in Caribbean Forester 2: 91. 1941.

Podocarpus Purdieanus f. *parvifolia* Grisebach in Mem. Amer. Acad. Sci., n. ser. 8: 530. 1862, non Parl.

Podocarpus Purdieanus sensu Grisebach in Fl. Br. West-Ind. 505. 1864, non Hook.

Podocarpus angustifolius var. *Wrightii* Pilger in Pflanzenreich IV. 5 (Heft 18): 89. 1903.

An aborescent shrub becoming a tree with sub-verticillate branches. Buds spherical with outer scales narrowly ovate, carinate, strongly apiculate and scarious at margins. Leaves sub-patent to spreading, coriaceous and shiny, up to 4 cm. long, 5–7 mm. wide, somewhat oblanceolate, broadly acute at the aristate apex, narrowed below into a short petiole, essentially flat on upper surface or with a suppressed ridge above midvein, sometimes slightly revolute at margins, with midvein more prominent below than above. Pollen cones cylindrical, axillary to leaves or bracts of previous year, sessile, 9–12 mm. long, 3–3.5 mm. wide. Microsporophylls with scarious broadly obtuse upturned apex. Ovulate cones on peduncles 2–3 mm. long, receptacle of 2 connately fused scales, spreading and obtuse, becoming fleshy above, up to 7 mm. long, the sterile scale narrow and shorter. Seed 7–9 mm. long, 4–5 mm. wide, edged by a ridge and with a pronounced crest.

DISTRIBUTION: Mountains of eastern Cuba.

SPECIMENS EXAMINED:

CUBA: Monte Verde, *Wright 1461* (ISOTYPE, GH, †Mo, NY, YU); Monte La Plancha, *Carabia 3843* (†NY), *Roig 162* (†NY); Farallon de la Perla, *Shafer 8785* (US).

27. *Podocarpus Ekmanii* Urban in Fedde, Repert. Spec. Nov. Reg. Veg. 18: 17. 1922; Florin in Arkiv. Bot. 25A: 1. 1934; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931; Carabia in Caribbean Forester 2: 91. 1941.

A shrub 2–4 m. tall with thickly leafy branchlets (internodes 1–3 mm. long). Buds nearly ovoid with broadly rounded carinate scales, the outer with a mucro about half as long as scale. Leaves stiffly coriaceous, straight or slightly falcate, linear-lanceolate, with spine at apex, narrowed below and sub-sessile, 1.5–2.5 cm. long, 3–4 mm. wide, flat or with a slight ridge above midvein on upper surface, the margins tending to be revolute and with midvein prominent below, where there are fine longitudinal striations on each side of midvein. Pollen cones unknown. Ovulate cones on short peduncles 1–2 mm. long; receptacle of 2 fused scales 3–4 mm. long, connate below, spreading above, with free triangular apices, becoming bright red when ripe. Seed ovoid 6–7 mm. long, 3.5–4 mm. wide, with ridge and a conical crest 1 mm. long.

DISTRIBUTION: Mountains of eastern Cuba at 500–900 m. alt.

SPECIMENS EXAMINED:

CUBA: Sierra de Cristal, *Ekman* 6790 (type coll. †Herb. Stockholm); Sierra Moa, *J. A. Shafer* 8058 (†NY, US); Camp San Benito, *J. A. Shafer* 4086 (NY).

28. *Podocarpus Buchii* Urban in Fedde Repert. Spec. Nov. Reg. Veg. 19: 298. 1924; Florin in Arkiv. Bot. 25A: 2. 1934; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931; Moscoso, Cat. Florae Domingensis 1. 1943.

A tree 6 m. or more high with dark green crowded foliage. Terminal buds nearly globose with orbicular carinate scales, the outer ones apiculate, the inner blunt. Leaves stiffly coriaceous, straight or only slightly falcate, linear-lanceolate, ending in a stiff spine 1–1.5 mm. long, narrowed at base to a 1 mm. long petiole, or sub-sessile, 1.5–2.8 cm. long, 4.5–6.5 mm. wide (*Ekman* 1403 from type locality has leaves up to 4 cm. long and 9 mm. wide, may be juvenile or belong to var. *latifolius*), with midvein somewhat prominent above toward base of leaf, obscure and slightly impressed toward tip, very conspicuous on lower side, stomatal rows conspicuous as longitudinal stripes. Pollen cones unknown. Ovulate cones axillary on peduncles 7–8 mm. long, receptacle of a pair of fused carinate scales, 8–10 mm. long, becoming very fleshy. Seeds elliptical 7–8 mm. long, 4–4.5 mm. wide, with a very prominent flat recurved crest, 1–1.5 mm. long.

DISTRIBUTION: In mountains of Haiti near Bellefontaine.

SPECIMENS EXAMINED:

HAITI: Morne Montie, *Ekman* 5738 (†ex Florin); Massif de la Belle, *Ekman* 1403 (US); Mornes des Commissaires, *Holdridge* 1252 (US).

- 28a. *Podocarpus Buchii* var. *latifolius* Florin in Arkiv Bot. 25A: 3. 1934; Moscoso, Cat. Fl. Domingensis 1. 1943.

Podocarpus angustifolius var. *Wrightii* Urban in Symbolae Antill. 8: 4. 1920.

An arborescent shrub or small tree with larger leaves up to 10 cm. long and 10 mm. wide, with a groove above midvein in many of its leaves, otherwise similar to typical form of species. (*Nash & Taylor* 1715, a shrub 4–6 ft., with leaves up to 5.8 cm. long and 10 mm. wide may represent a large juvenile foliage.) Female cones on peduncles 4–7 mm. long, receptacle a pair of fused scales 3–4 mm. long, connate below, divergent above. Seed ellipsoidal 6–7 mm. long, 3.5–4 mm. wide, with a prominent conical flattened crest, smaller but very similar to species.

DISTRIBUTION: Haiti in Massif du Nord.

SPECIMENS EXAMINED:

HAITI: Morne Belanse, *Ekman* 4913 (ISOTYPE, †US), *Nash & Taylor* 1715 (US).

This variety is very similar to *P. Leonii* Carabia but differs in having longer peduncles and receptacle, and somewhat smaller seeds. The plants are probably closely related in their origin and each has undergone slight changes since becoming isolated from the Cuban mountains by the Windward Passage.

29. *Podocarpus nubigenus* Lindley in Paxton, Flow. Garden 2: 162, fig. 218. 1851-52, in Jour. Hort. Soc. 6: 264. 1851; Gay, Fl. Chilena 5: 404. "1849" (1852); Carrière, Traité Conif. 650. 1867; Parlatore in DC. Prodr. 16(2): 513. 1868; Van Tieghem in Bull. Soc. Bot. France 38: 169. 1891; Pilger in Pflanzenreich IV. 5 (Heft 18): 82. 1903; Pilger in Nat. Pflanzenfam. ed. 2, 13: 247. 1926; Reiche, Veg. der Erde 8: 63-64. Leipzig 1907; Dallimore & Jackson, Handb. Conif. 53. 1923, 1931; Covas, Revista Argentina Agron. 6: 24. 1939; Florin in Svenska Vet.-Akad. Handl. ser. 3, 10(1): 279. 1931.
Saxe-Gothaea gracilis Hort. ex Gord. Pinet. 280. 1858.

A tree up to 15 m. or more in height. Branches short, sub-verticillate and sub-opposite, thickly leafy, clothed by decurrent leaf bases, forming a grooved surface. Buds conically ovoid, of coriaceous lanceolate or attenuate pungent scales (Plate VIII, Fig. 1). Leaves stiffly coriaceous, crowded, linear-lanceolate, patent to divaricately spreading, green above with a distinct ridge above midvein, flat beneath but with a pair of glaucous bands (Plate VIII, Fig. 2) on each side of midvein, with stomata confined to these bands, leaving green margins, 2-4 cm. long, 3-5 mm. wide, with pungent or acute tips, narrowed below, sessile, with leaf bases decurrent on the stem. Leaves usually retained for many successive years growth. Cross-section of leaf shows organized transfusion tissue absent; it is represented by a few isolated sclereids only; hypoderm on upper side is continuous. Pollen cones solitary, axillary, or fascicled 1-3 mm. peduncles, usually aggregated near tips of twigs (Plate VIII, Fig. 2), and arising on twig of newest growth, subtended by triangular, carinate, apiculate bracts, sessile, or when clustered or fascicled on peduncles up to 5 mm. long, cylindrical, 9-15 mm. long, 2.5 mm wide. Microsporophylls with prominent, broadly obtuse and scarious margined upturned apiculus. Female cones (Plate VIII, Fig. 3) axillary, of a pair of fused, thickened, unequal scales with spreading triangular apices, becoming fleshy, on peduncles 1-1.5 mm. long. Seed sub-globose, elongated by a very blunt crest, about 9 mm. long and 8 mm. wide.

DISTRIBUTION: Open woods in very wet places, 50-780 m. altitude, in southern Chile and Argentina (49° S. Lat., the southernmost range of *Podocarpus*).

SPECIMENS EXAMINED:

CHILE: Santiago: Ames in 1906 (US). Valdivia: Hills above Corral, West 4885 (GH, Mo, UC), Gunckel 57 (†F, Mo), Sargent in 1906 (A, †Mo); Cordillera de la Costa, Anon. (A); Osorno, Morrison 17628 (GH, UC); Cordillera Pelade, Chaihuin, Gunckel 3029 (A); Krause s.n. (US); Trevisanus in 1863 (ex Philippi) (NY); Buchtien s.n. (US). Chiloe: King's Collector, (NY); Junge 90 (†Mo); Almán, Espinosa 113 (Mo); Puerto Montt, Joseph 3308 (US). Patagonia: Eden Harbor, Ball in 1882 (GH, NY); Hill in 1872 (GH). Province not given: Cunningham in 1866-67 (GH), Husbands 850 (US).

ARGENTINA: Rio Negro Territoria, between Puerto Blest and Laguna Frias, West 4829 (UC), Lago Nahuel Huapi, Puerto Blest, Cabrera 6087 (GH).

EXPLANATION OF PLATES

PLATE I

FIGURE 1. *Podocarpus Reichei*, Carlos Reiche in 1927 from Puebla, Mexico, showing long-attenuate vegetative bud scales, detached seeds at right, immature buds of male cones on twig at left. Natural size.

FIGURE 2. *Podocarpus Pittieri*, Steyermark 55098 from Federal District, Venezuela, showing auxiliary sclereids in palisade and mesophyll. $\times 65$.

FIGURE 3. *Podocarpus Roraimae* Pilger, Steyermark 58949 from Mt. Roraima, Venezuela, showing large hypoderm fibers and the large lumen of the lower hypoderm fibers. $\times 65$.

PLATE II

FIGURE 1. *Podocarpus Matudai* var. *macrocarpus*, Matuda 956 on April 5, 1936, from Mt. Ovando in Chiapas, Mexico, showing long vegetative bud scales, long peduncles of seeds. Natural size.

FIGURE 2. *Podocarpus Matudai* var. *macrocarpus*, Steyermark 48589 from Guatemala, showing three seeds which had been kept in alcohol and on the right a single dried seed for comparison. Both from the same specimen. Natural size.

PLATE III

FIGURE 1. *Podocarpus Pittieri*, Steyermark 57035 from Federal District, Venezuela. Epidermis, $\times 570$.

FIGURE 2. *Podocarpus Rusbyi*, Rusby 2463 from Mapiri, Bolivia. Epidermis, $\times 570$, showing smaller cells and thickened walls at corners.

FIGURE 3. *Podocarpus Steyermarkii*, Steyermark 60876 from Bolivar, Venezuela, showing deep groove at upper midrib, single resin canal, fibers above and below vascular bundle, wing-like transfusion tissue with accessory transfusion tissue extending from above and below into blade of leaf. $\times 65$.

PLATE IV

FIGURE 1. *Podocarpus Rusbyi*, Rusby 2463 from Bolivia, showing long vegetative bud scales, seeds with obtuse crest. Natural size.

FIGURE 2. *Podocarpus trinitensis*, Broadway 7151 from Trinidad, showing seed with obscure crest. Natural size.

PLATE V

FIGURE 1. *Podocarpus guatemalensis* Standley, Standley 25090 from Puerto Barrios, Guatemala, showing very small vegetative bud with short scales. Natural size.

FIGURE 2. Bud of above specimen enlarged. $\times 5$.

PLATE VI

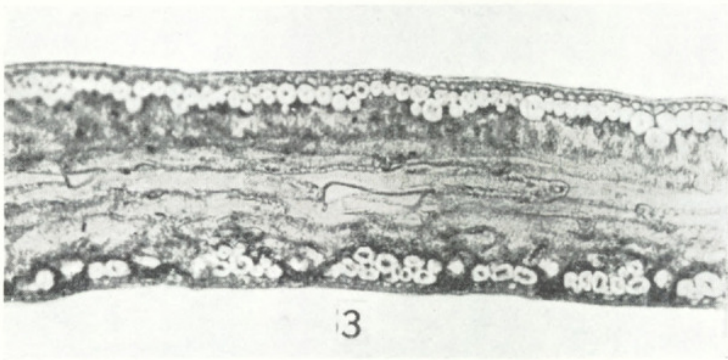
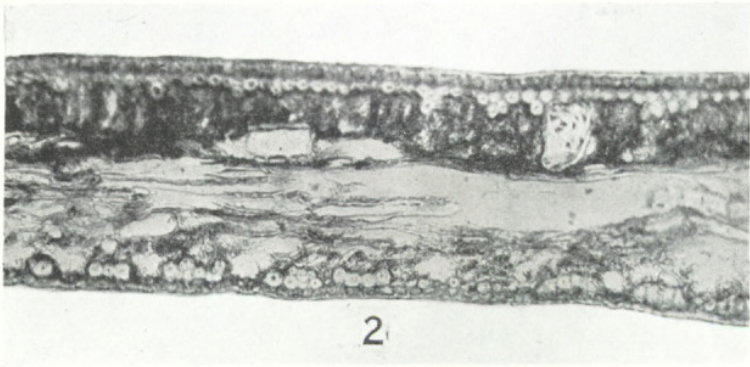
FIGURE 1. *Podocarpus guatemalensis* var. *pinetorum*, Bartlett 13109 from Pine Ridge, British Honduras, showing prominent midrib, interrupted hypoderm at midrib, and fibers above vascular bundle. $\times 65$.

FIGURE 2. *Podocarpus pendulifolius*, Steyermark 57115 from Tachira, Venezuela, showing blunt, rounded, almost swollen margin and doubled hypoderm. $\times 65$.

FIGURE 3. *Podocarpus oleifolius*, Smith 6856 from Mt. Poas, Costa Rica, showing vegetative bud with short obtuse scales and immature pollen cones. Natural size.

PLATE VII

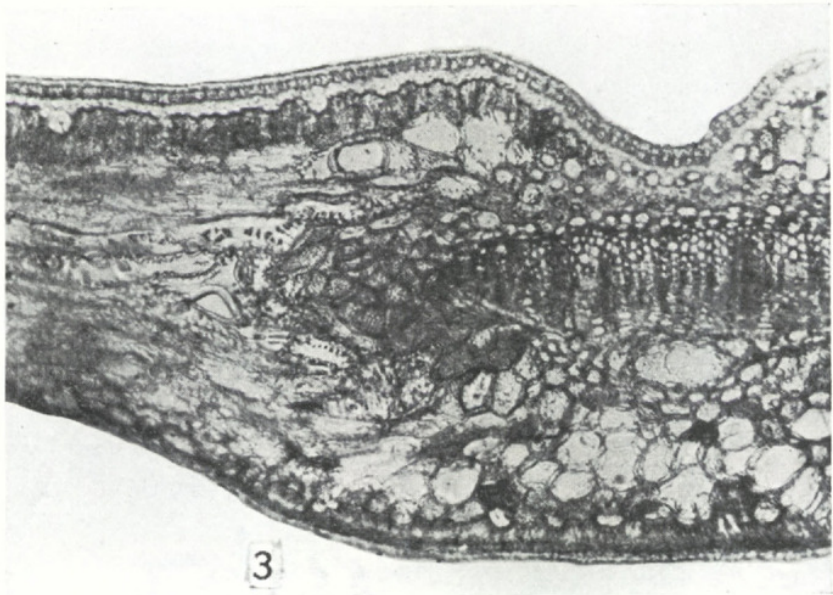
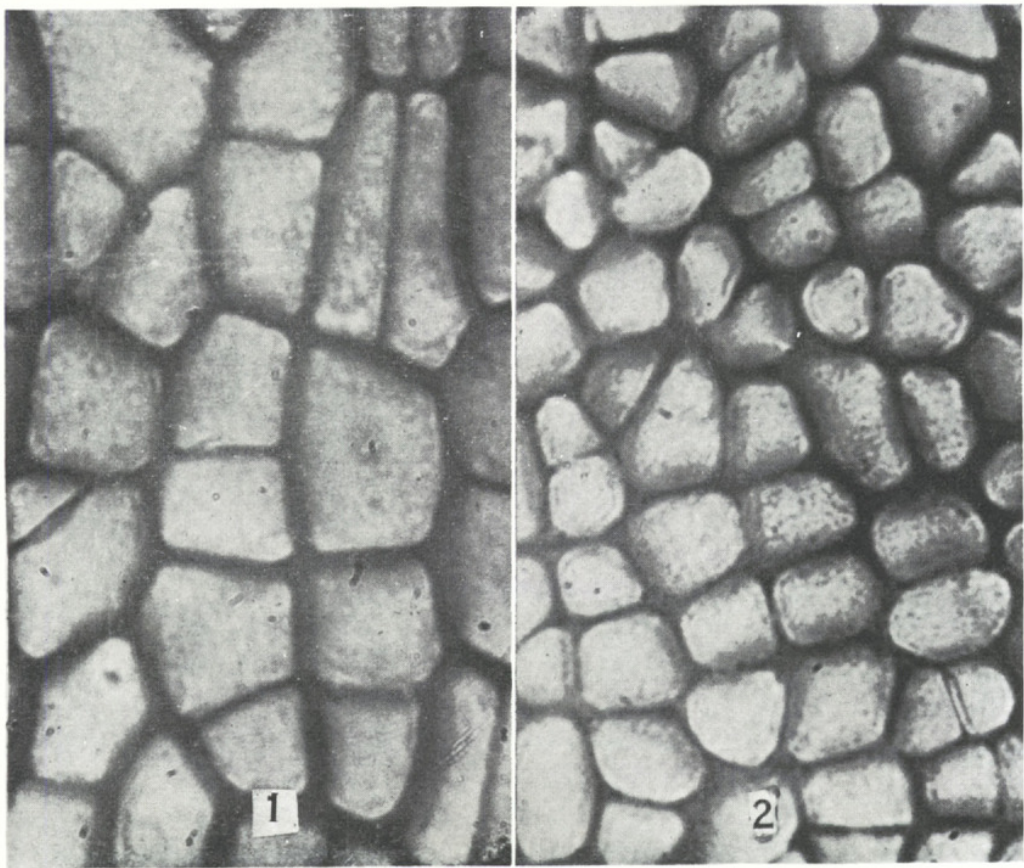
FIGURE 1. *Podocarpus Cardenasii*, Cardenas 3053 from Cochabamba, Bolivia, showing vegetative bud with attenuate scales and pedunculate clusters of pollen cones. Natural size.



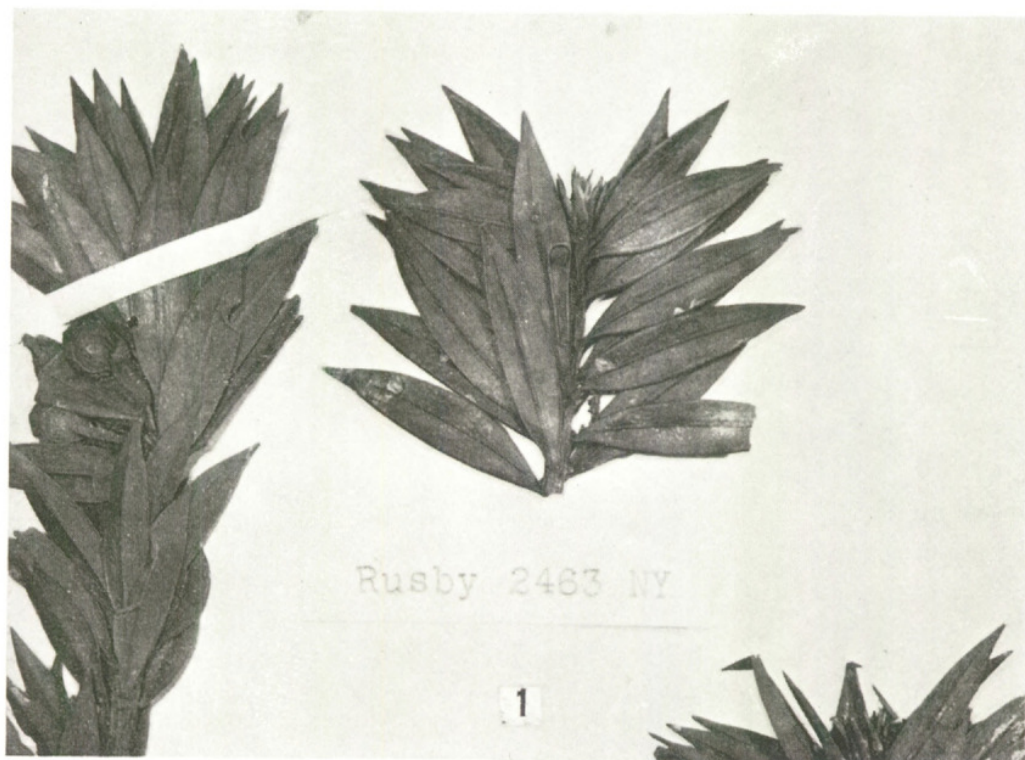
REVISION OF *PODOCARPUS*



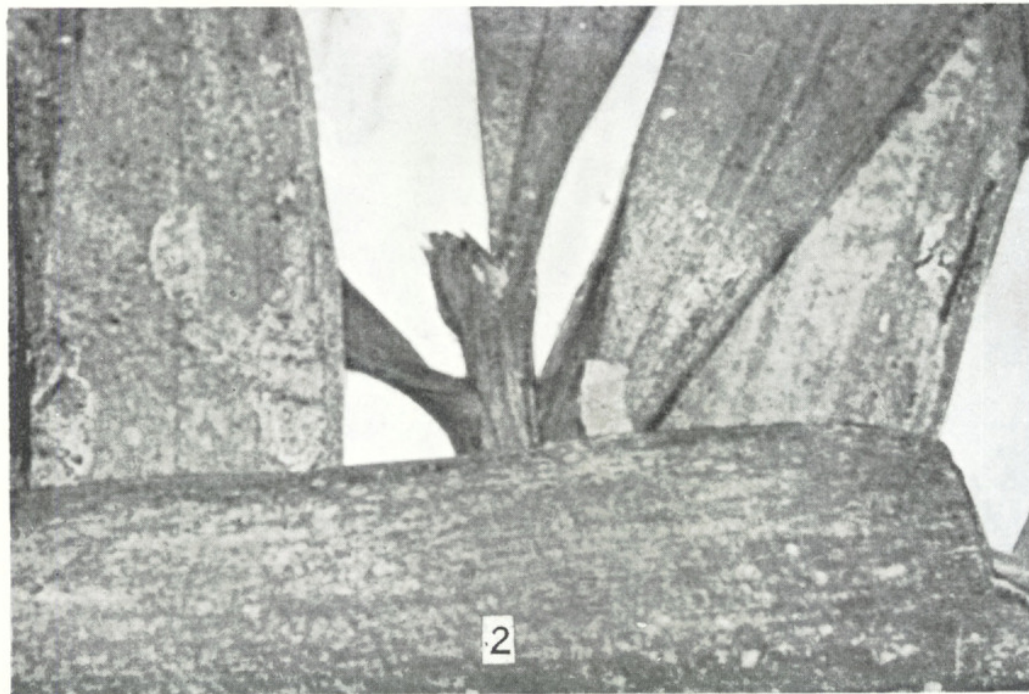
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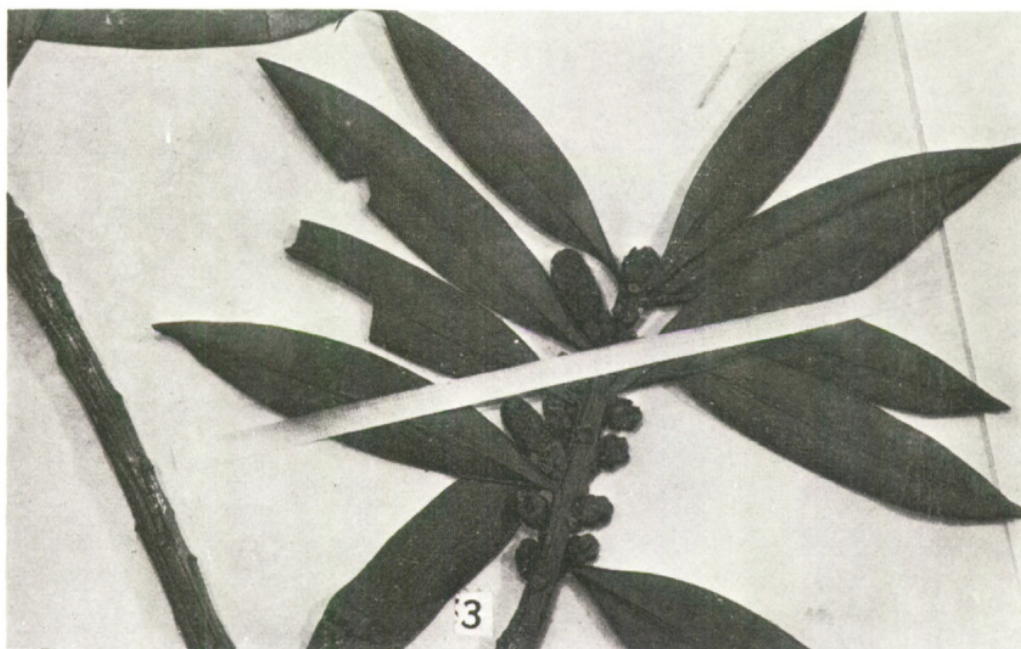
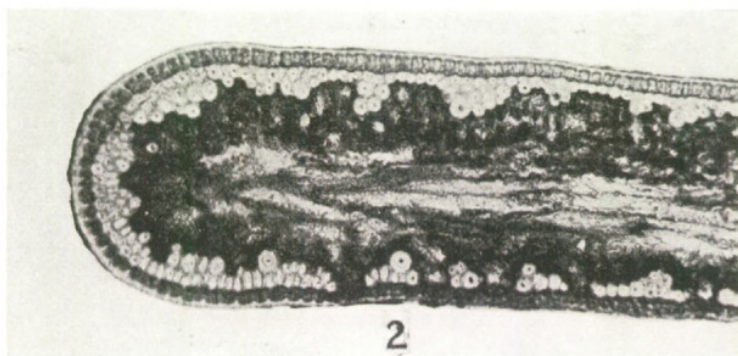
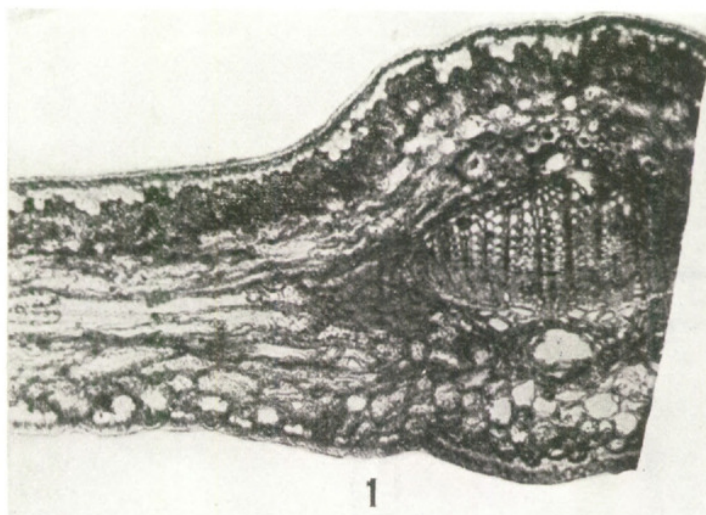
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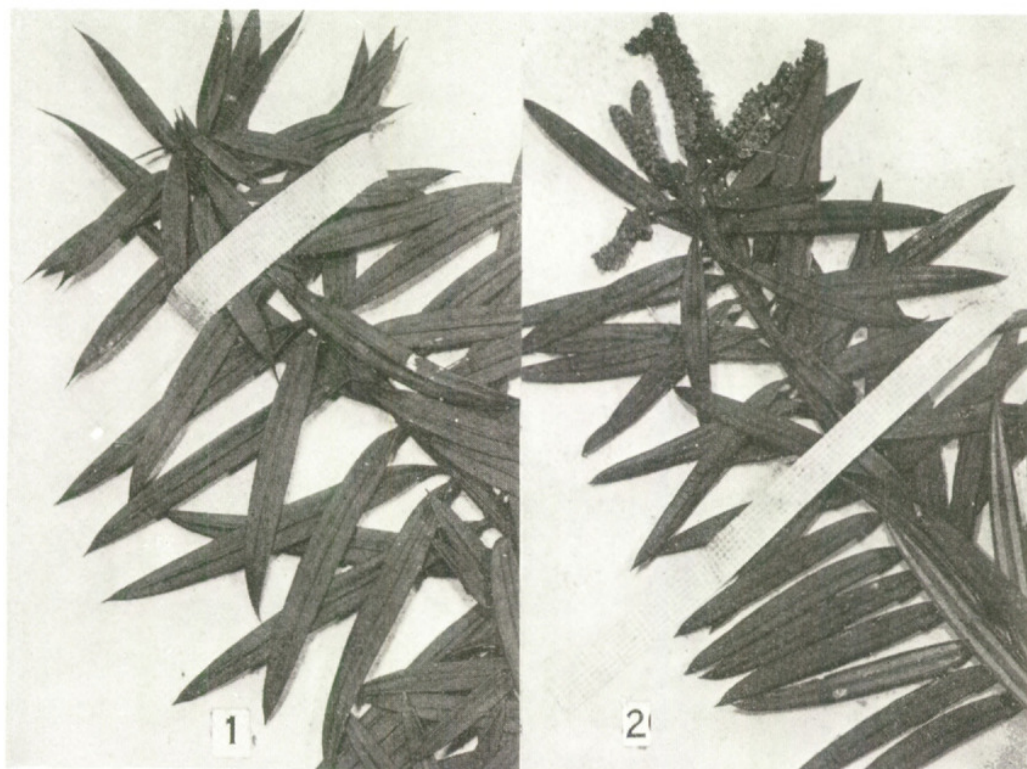
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Buchholz, J. T. and Gray, Netta E. 1948. "A taxonomic revision of Podocarpus---IV. The American species of section Eupodocarpus, sub-sections C and D." *Journal of the Arnold Arboretum* 29(2), 123–151.

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