BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JULY 18, 1947 VOL. 12, NO. 10

A CONSPECTUS OF THE GENUS CUNURIA

BY
J. T. BALDWIN, JR.[1] AND RICHARD EVANS SCHULTES[2]

THE writers of the present article became interested in the euphorbiaceous genus *Cunuria* as the result of independent field studies of *Hevea*, the genus of the Pará Rubber Tree. These genera are related, and, indeed, it has been suggested (Baldwin in Journ. Heredity 38 (1947) 54; in Am. Journ. Bot., in press, "*Hevea rigidifolia*") that they possibly have hybridized. A critical classification of the several concepts of *Cunuria* and an understanding of their geographic distribution may contribute greatly to an interpretation of the complex of genera to which *Cunuria* shows affinities.

I

Cunuria belongs to the tribe *Jatropheae*. The genus appears to be related to *Micrandra*, *Hevea*, *Joannesia*, and *Nealchornia*, and has especially close affinities with *Micrandra* and *Hevea*. Bentham (in Journ. Linn. Soc., Bot. 17 (1880) 185–268) observed that the first four of

[1] Professor, William and Mary College; Collaborator, Rubber Plant Investigation, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S. Department of Agriculture.

[2] Botanist, Rubber Plant Investigations, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S. Department of Agriculture; Research Fellow, Botanical Museum, Harvard University.

these genera "may to a certain degree be related to each other." Huber later described the monotypic fifth genus.

Croizat, however, in a manuscript report on the *Euphorbiaceae* of the Tafelberg expedition, has stated of *Cunuria:* "This genus would seem to be improperly placed in the *Euphorbiaceae Gelonieae.* I should be inclined to think that *Garcia* Vohl, *Sagotia* Baill., *Ostodes* Bl., and *Cunuria* Baill., are not too far distantly related."

From *Micrandra, Cunuria* may be distinguished by its glandular stipules; by differences in the form of the petiole glands, as well as of the disks and staminodes; and by the number and form of the stamens. *Cunuria* is at once set apart from *Hevea* by having simple rather than compound leaves; by having stipules; and by lacking a staminate disk. It likewise differs from *Joannesia* by having entire leaves as well as by being apetalous. *Joannesia* appears to be diploid, whereas *Cunuria, Micrandra,* and *Hevea* are, in great measure, tetraploid (Baldwin in Journ. Heredity, *loc. cit.*). From *Nealchornia, Cunuria* can very readily be separated by its having a pistillate disk; by the presence of a rudimentary ovary in the staminate flower; and by differences in the form of staminodes and styles. *Cunuria,* at first considered to be completely dioecious, was recognized by Ducke (in Notizbl. Bot. Gart. Berlin 11 (1932) 586) as having monoecious representatives.

As now known and interpreted, *Cunuria* comprises four species and one variety. Two species are established in the present paper, and one concept, recently described as a species, is here reduced to varietal rank.

II

The distribution of *Cunuria* is indicated on the accompanying map (Fig. 1). Strictly speaking, *Cunuria* is not a characteristic element of the flora of the great

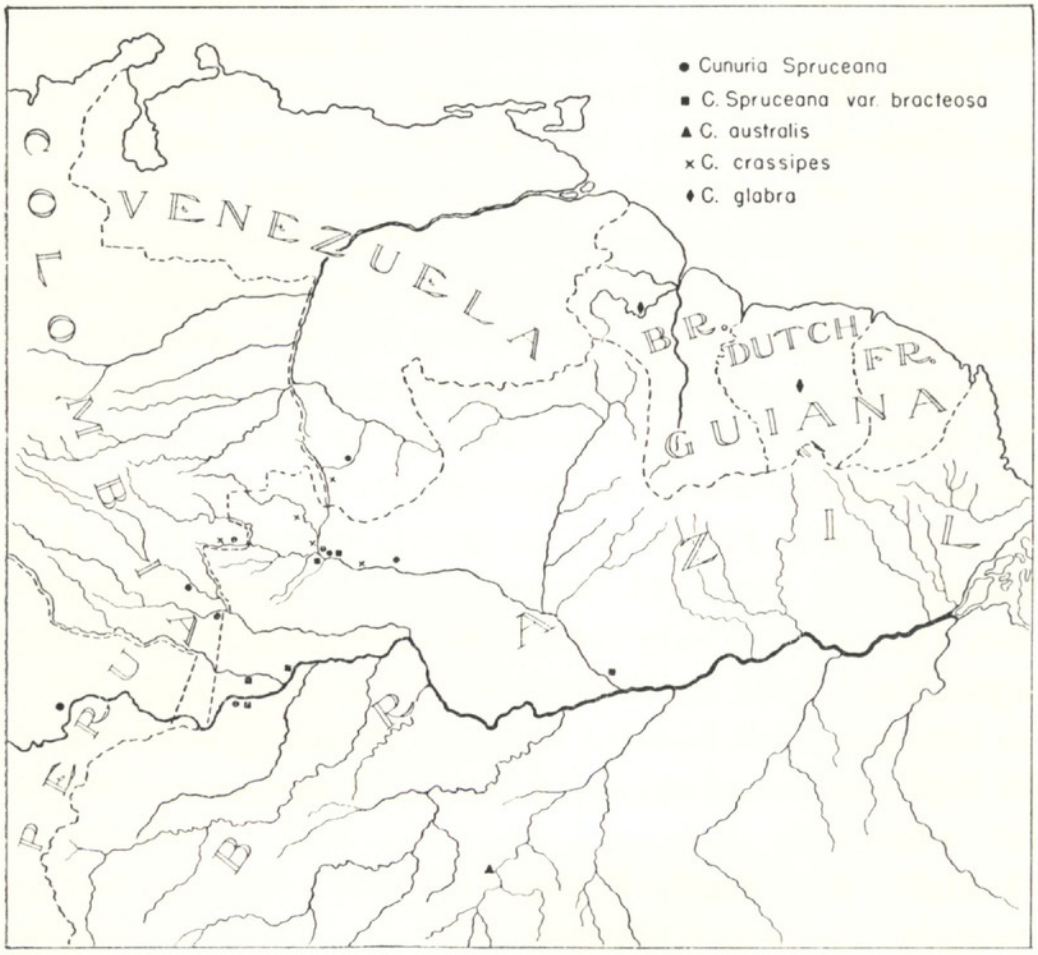


FIG. 1. Map showing the distribution of the species of *Cunuria*.

Amazonian *planada*. The genus is typical of higher elevations. It could be referred to as an element of the "upland" flora of the Amazonian region, but that expression might connote the eastern slopes of the Andes, where the genus apparently is not represented. Since *Cunuria* prefers the higher areas in the Amazonian region, it may be interpreted as a very old genus that has spread from the ancient Venezuela-Guiana land-mass. Both Schultes (in Caldasia 3, no. 12 (1944) 124–130; in Chron. Bot. 9, no. 2/3 (1945) 123–127) and Baldwin (in Journ. Heredity and in Am. Journ. Bot., *loc. cit.*) have suggested that the hills rising sharply out of the Amazonian plain in the Rio Negro–Rio Uaupés[3] area of Brazil and Colombia possibly represent a route, now discontinuous, along which plants migrated southwestward from the Venezuela-Guiana region. There may also have been another route southward from the Guianas. Baldwin (*loc. cit.* and in Am. Journ. Bot. 33 (1946) 215–216) has considered the Uaupés area to be the center of variability of both *Hevea* and *Cunuria*.

Representatives of *Cunuria* are known from the ancient mountains in southern British Guiana and Surinam. The genus is also represented in southern Venezuela along the Casiquiare. It is common along the upper Rio Negro in Brazil and along the lower Rio Uaupés in Brazil and Colombia as well as in the area around São Paulo de Olivença (one of the highest localities along the Rio Solimões) and in the vicinity of Manáos (a relatively high area near the confluence of the Rio Negro with the Solimões, with a vegetation rather like that of the region of Serra de Sapucuá, mentioned below). *Cunuria* is exceedingly abundant on the slopes of Cerro de La Pedre-

[3] The Rio Uaupés, flowing through Colombian as well as Brazilian territory, is known as the Río Vaupés in Colombia.

ra on the Río Caquetá (Japurá) in eastern Colombia. It is known from a single Peruvian locality near Iquitos in Loreto and has been collected from the high plateau between the Rio Livramento and the Rio Ipixuna, tributaries of the Madeira, in Brazil.

To these records we may add reports which suggest other areas where *Cunuria* possibly exists. South of the mountains in the Guianas where the genus has been collected, "there are some hills off the Rio Trombetas and near the Lago de Sapucuá, known as Cunurí mountains, ... probably reaching four hundred feet" (Brown, C. B. and W. Lidstone: Fifteen thousand miles on the Amazon and its tributaries (1878) 241). Since the name *cunurí* is commonly applied to various species of *Cunuria* in Brazil and since the genus often dominates the slopes of such low mountains, as observed on Cerro de La Pedrera by Schultes and at Montepelago on the Rio Uaupés by Baldwin, we presume that *Cunuria* is common on the hills designated by Brown and Lidstone. These hills are probably the ones now known as Serra de Sapucuá. In 1943, a native rubber producer wished to demonstrate to Baldwin a new kind of buttressed rubber tree which might well be a representative of *Cunuria.* In the Rio Madeira region, Schultes heard repeated references to gigantic, buttressed rubber trees which were locally known as *pae da seringueira*—"father of rubber trees." These are reputedly abundant west of Humaytá, between the Rio Madeira and the Rio Purús, and they may belong to *Cunuria.*

If the theory be accepted that an inland sea, opening westward, once covered a great part of what is known as the Amazonian *planada*, *Cunuria* might be considered to be an element of the flora of the heights fringing the shores of the sea. Accordingly, one would reasonably expect additional collections of *Cunuria* to help indicate

the limits of that sea, for which now only a hazy outline can be suggested.

III

CLAVIS SPECIERUM VARIETATISQUE GENERIS CUNURIAE:

A. Folia chartacea, leviter marginata. Petioli graciles, 1/3 foliorum partem aequantes vel longiores.

B. Folia circiter 2/3 lata quam longa, plerumque 11 cm. longa, 7 cm. lata, sicco brunneo-fusca, nitida sed non glauca, venis subtus elevatis, brunneis. Florum bracteae minutissimae. Stipulae usualiter caducae. Inflorescentiae saepe compactiores. (4) *Cunuria Spruceana*

BB. Folia circiter 1/2 lata quam longa, plerumque 15–16 cm. longa, 7–8 cm. lata, sicco straminea, utrinque glauco-nitidissima, venis non elevatis, subimmersis, luteis. Florum bracteae magnae, usque ad 6 vel 7 mm. longae. Stipulae valde persistentes. Inflorescentiae saepe laxae. (5) *Cunuria Spruceana* var. *bracteosa*

AA. Folia firme coriacea, valde marginata. Petioli crassi, 1/5 foliorum partem aequantes vel breviores.

C. Petioli crassi. Capsulae parvae, usque ad 3.5 cm. longae vel breviores.

D. Folia elliptica, sicco laminis discoloribus, apice obscure acuminata, basi usualiter cuneata vel subcuneata. Venae tertiae venis secundariis paralleles, immersae. (2) *Cunuria crassipes*

DD. Folia late ovata, sicco laminis subconcoloribus, apice abrupte acuminata, basi usualiter rotundata. Venae tertiae venis secundariis angulatim 90°, omnes elevatae. (1) *Cunuria australis*

CC. Petioli crassissimi. Capsulae magnae, 5 cm. longae vel longiores. (3) *Cunuria glabra*

IV

Cunuria *Baillon* in Adansonia 4 (1863–64) 287; Mueller Argoviensis in DC. Prodr. 15, pt. 2 (1866) 1123; Mueller Argoviensis in Martius Fl. Bras. 11, pt. 2 (1874) 507; Baillon Hist. Pl. 5 (1874) 190; Baillon Nat. Hist. Pl. 5 (1878) 190; Bentham et Hooker fil. Gen. Pl. 3 (1880) 289; Baillon Dict. Bot. 2 (1886) 299; Pax in

Engler & Prantl Pflanzenfam. 3, Abt. 5 (1890) 77; Pax in Engler Pflanzenr. IV. 147 (Heft 42) (1910) 16; Lemée, Dict. Genre Pl. Phan. 2 (1930) 413; Record in Trop. Woods 54 (1938) 18; Record & Hess, Timb. New World (1943) 157.

Clusiophyllum Mueller Argoviensis in Flora 57 (1864) 518.

Descriptio archetypa:

"Flores dioeci. Masc. ignoti. Foem. calyx 5-partitus, laciniis persistentibus imbricatis. Discus hypogynus (an androcaeum abortivum?) cupulaeformis glandulosus 6–8-lobus; lobis cuspidatis ovarii loculis dum 6 adsint) per paria oppositis. Ovarium liberum 3-loculare; loculis uniovulatis; ovulo pendulo obturato; micropyle extrorsum supera. Stylus sessilis 3-partitus; laciniis crassis 2-fidis reflexis ovario adpressis.

"Arbor ? foliis alternis, stipulis infraaxillaribus folia juniora (ut in Artocarpeis) involventibus caducis; limbo simplici basi glandulis 2 sessilibus concavis munito."

Descriptio amplificata:

Arbores magnae, elatae, parco cum succo lacteo, foliis alternis, petiolatis, stipulis infraaxillaribus folia juniora involventibus caducis. Folia integra, penninervia, coriacea vel firme chartacea, pagina supra basim biglandulosa, costis secundariis angulo amplo decurrentibus, arcuatis, tertiis reticulatis vel subparallelis. Pedunculi laterales vel axillares, foliis multo breviores, rigidi, staminati simplices vel parce ramosi, floribus in apice cymarum pauciflorum ramorum sessilibus. Flores dioeci vel monoeci, apetali. Floris staminati sepala quinque, valde imbricata, quincuncialia; discus nullus; stamina decem receptaculo elevato affixa; filamenta brevia libera; antherae dorsifixae, loculi connectivo latiusculo adnati, longitudinaliter de-

hiscentes, rudimentum ovarii tripartitum. Floris pistillati sepala quinque, laciniis eis maris similia; discus hypogynus cupuliformis, glanduloso-lobatus vel simplex, ovarium liberum triloculare, loculis uniovulatis; stylus sessilis, tripartitus cum divisionibus bifidis, crassus, reflexus, ovario adpressus. Fructus capsularis; capsula magna, subglobosa vel saepe quasi ovoidea, in coccas bivalves partiens, carnoso cum epicarpio et lignoso cum endocarpio crasso. Semina magna, ovoidea, testa crustacea et nitidissima, immaculata, ecarunculata. Albumen carnosum; cotyledones planae, latae.

Species typicus: *Cunuria Spruceana.*

Nominis generis significatio: "Cunurí" in regione typica nomen vulgare est.

V

1. **Cunuria australis** *R. E. Schultes sp. nov.*

Arbor magna, usque ad 20 m. alta. Rami robusti, cinereofusco cum cortice crasso. Ramuli aequales, subteretes, glabri, apice ipso autem cum stipulis caducissimis, minute adpresso-pubescentibus. Stipulae triangulares, minutae, 6 mm. ×2 mm. Petioli crassissimi, 30–35 mm. longi. Folia coriacea, marginata, late elliptica, apice abrupte acuta, basi rotundata, 14–16 cm. longa, 7.5–9.5 cm. lata, venis supra nitidis glabrisque, non elevatis, sicco stramineis, infra prominenter elevatis, fuscis, glandulis duabus comparate parvis, 1 mm. latis, fusco-nigricantibus limbi basi. Flores ignoti. Capsulae subglobosae, sicco usque ad 3.5 cm. longae, 3.5 cm. in diametro; epicarpio glabro, tenui, superne plus minusve 3 mm. crasso, non conspicue fibroso; endocarpio lignoso, tenui, usque ad 2 mm. crasso; valvis regularibus, dehiscentibus non contortis, 2.8 cm. longis, 1.2 cm. latis, intus aureo-brunneis et striolatis. Semina ignota.

Brazil: Estado do Amazonas—Basin of Rio Madeira, Municipality Humaytá, on plateau between Rio Livramento and Rio Ipixuna. "Tree 60 ft. high. Cipoal." *B. A. Krukoff's 5th Exped. Braz. Amaz. 7201*, November 7-18, 1934. (Typus Herb. Arnold Arb.; Herb. N.Y. Bot. Gard.; Herb. Jard. Bot. Rio.)

This is the only representative of the genus which occurs at any significant distance south of the Amazon River, a consideration which has suggested the specific epithet. This new species of *Cunuria* is of considerable interest because it has a capsule rather comparable to that of *C. crassipes*, whereas in vegetative characters it is extremely similar to *C. Spruceana*.

The petioles of *Cunuria australis* are much thicker than those of *C. Spruceana*, and the leaves appear to have been, in life, a bit more coriaceous in texture. The stipules, if indeed they are present on *Cunuria australis*, are very caducous, just as they are in *C. Spruceana*. *Cunuria australis* is probably more closely allied to *C. Spruceana* than to *C. crassipes*, and the specimens have, in the past, been identified as representing *C. Spruceana*. The ligneous valves of *Cunuria australis* apparently do not open violently, as in the other species of the genus; the lack of the characteristic twisting of the valves is interpreted as indicative of slow and gradual dehiscence. A parallel example can be cited in the case of *Hevea minor* Hemsl., the only species in the genus in which the valves open slowly, not in a violently explosive manner, and persist for some time after the seeds have dropped. The fruit of *Hevea Spruceana* (Benth.) Muell. Arg. open explosively, but the valves remain on the tree. The capsule of *Cunuria australis* is only about half as large as that of *C. Spruceana;* the woody endocarp is rather thin, and the fleshy epicarp is much thinner and measurably less fibrous. The difference in size of the fruit is so great that, even lacking the other characters of shape and

texture, it would be obvious that the Madeira collection is specifically distinct from *Cunuria Spruceana.*

One could easily suspect that the Rio Madeira material represents a combination of characters from two species, in which case there might be apprehension that a specific name is being assigned to a segregant from interspecific crossing. *Cunuria crassipes*, apparently an extremely localized endemic of the Rio Negro area, could be considered one parent of such an hypothetical hybrid, and *C. Spruceana*, also known only from a region far to the north of the Rio Madeira, the other. Possibly future exploration may turn up material of *Cunuria Spruceana* and *C. crassipes* in the Rio Madeira. These species grow in caatingas, often in association with *Hevea rigidifolia*, *H. viridis* and *H. pauciflora* var. *coriacea* (possibly correctly called *H. confusa*). All these plants, when "pure," seem to have precise ecological requirements, and these requirements are similar for each of the species cited. It is interesting, therefore, that *Hevea viridis* is known from Borba on the Rio Madeira and that *H. camporum* (which Ducke is considering as possibly a form of *H. pauciflora* var. *coriacea* and which Baldwin would refer to *H. confusa*) is known from the great plateau at the headwaters of the Rio Marmellos, an affluent of the Madeira. These localities are not distant from the general region where the type material of *Cunuria australis* was found. It would not be surprising, therefore, to discover in this area additional species of *Cunuria* or any of the already recognized species. Certainly the requisite ecological conditions exist in the Madeira Valley.

2. **Cunuria crassipes** *Mueller Argoviensis* in Martius Fl. Bras. 11, pt. 2 (1874) 510; Corrêa Diccion. Pl. Uteis Brasil. 2 (1931) 482; Pax in Engler Pflanzenr. IV. 147 (Heft 42) (1918) 17.

Clusiophyllum Sprucei Mueller Argoviensis in Flora 57 (1864) 518.

COLOMBIA: Comisaría del Vaupés—Río Papurí, vicinity of Piracuara Mission, alt. about 200 m. "Trees tall, slightly buttressed, averaging 30 m. in height and 60 cm. in diameter. Bark thin, averaging less than 1 cm. Latex yellowish, scant, coagulating to a non-elastic gum. Flowers greenish yellow. Trispermate Hevea-like capsule. Known locally as *wah-so-né-né* in Tukano." *Paul H. Allen 3068*, August 18, 1943. (Herb. Gray).

VENEZUELA: Territorio del Amazonas—"Arbor 70-pedalis. In sylvis ad basin montis Cocui," July 1853. *Spruce 3029* (Herb. Kew); "Prope San Carlos ad Rio Negro" *Spruce 3029* (*3474*) (Herb. Kew; Herb. Brit. Mus.; Herb. Univ. Cambr.); "Prope San Carlos ad Rio Negro, 1853–54" *Spruce 3473* (Herb. Brit. Mus.); "Arbor lactescens 60-pedalis. San Carlos, in sylvis." April 1854 *Spruce 3474* (Herb. Kew; Herb. Univ. Cambr.)—Río Negro, near San Carlos. *Richard Spruce 3474*, 1853–54 (LECTOTYPUS: Herb. Gray; Herb. N.Y. Bot. Gard.).—Same locality. *Richard Spruce 3029*. (Photo.spec. Hort. Berol. in Herb. Gray; Herb. Field Mus. 646435).

BRAZIL: Estado do Amazonas—Rio Uaupés, Montepelago. "In a sort of caatinga-forest. Tree to 60 ft., buttressed. Fruit cherry-colored, just as in *Hevea confusa* and in contrast to the green fruit of *C. Spruceana* and *Cunuria* sp. at Foz do Uaupés. Chromosomes: $2n=36$." Nom. vulg. *cunurí*. *J. T. Baldwin Jr.*, *3673*, March 17, 1944. (Herb. Arnold Arb.; Herb. Instit. Agron. Norte; U.S. Nat. Herb.; Herb. Kew.)—Same locality. "In a sort of caatinga-forest. Tree to 40 ft., buttressed. Latex white. Fruit flushed with cherry red. Chromosomes: $2n=36$." Nom. vulg. *cunurí*. *J. T. Baldwin, Jr. 3675*. March 17, 1944. (Herb. Arnold Arb.; U.S. Nat. Herb.)—Same locality. "Tree to 40 ft., buttressed. Fruit cherry red. In a sort of caatinga-forest. Chromosomes: $2n=36$." Nom. vulg. *cunurí*. *J. T. Baldwin, Jr. 3681*, March 3, 1944. (Herb. Arnold Arb.; Herb. Instit. Agron. Norte; U.S. Nat. Herb.; Herb. Kew.)—Foz de Uaupés. "Total height of 60 ft., buttress of 3 ft. Wood of this tree in Harvard collection. Growing not far from *C. Spruceana*, *Micrandra*, *Hevea viridis*, and *H. guianensis*. Chromosomes: $2n=36$". Nom. vulg. *cunurí da caatinga*. *J. T. Baldwin, Jr. 3698*, March 13, 1944. (Herb. Arnold Arb.; Herb. Instit. Agron. Norte; U.S. Nat. Herb.; Herb. Kew.)—Iraruca, Içana. "Árvore 15 ms., 20 cm. (diam.) Latex. Madeira dura, folhas quebradiças, verde negro no dorso; claro no ventre. *Cunurí*.

Caatinga." *Ricardo de Lemos Fróes 21396*, Nov. 16, 1945. (U.S. Nat. Arb. Herb. 182206.)

Enough collections of *Cunaria crassipes* are now available to assure us that this species concept is comparatively constant. Apparently the species is a very localized endemic of the upper Rio Negro area and the adjacent lower Uaupés. This region is known to have high endemism, a fact which is emphasized occasionally, as when Allen rediscovered *Cunuria crassipes*, one of the endemics which Spruce collected there almost a century ago.

No other known species of *Cunuria* has the venation of *C. crassipes.* Its coriaceous, strongly marginate leaves are supplied with a relatively strong central nerve, rather prominently elevated on the under surface but only slightly so above; eight or nine secondaries which are extremely slender and hardly elevated; and tertiaries which anastomose but which are, in general, parallel to the secondaries. In all other species, the tertiaries are set at right angles to the secondaries and are not parallel. All specimens of *Cunuria crassipes* which have been available for study have the upper and lower surface of the leaf very unequally discolored when dry, the upper usually conserving a very characteristic bluish-grey glaucescence.

The flowers of *Cunuria crassipes* are still unknown. The specimen of *Fróes 21396* in the U.S. National Arboretum Herbarium has the remnant of one flower in a poor state of preservation. It is possible to ascertain from it, however, that the flower is much larger than in *Cunuria Spruceana.*

According to the collector's notes, *Baldwin 3673*, *3675* and *3681* have a capsule with a cherry-red epicarp when ripe. *Cunuria Spruceana*, as stated on the label of *Baldwin 3673*, has a green epicarp.

Baldwin 3698, which is here included under *Cunuria crassipes*, is larger than the typical material. The collec-

tor has indicated that the tree was more robust than the other representatives of the species which he examined and that there were visible differences in wood-texture. The leaves of *Baldwin 3698* are larger and more broadly elliptic than is characteristic of the species. Furthermore, the fruit is green instead of the usual cherry-red. While it may be true that *Baldwin 3698* does not represent a "pure" line of *Cunuria crassipes*, there are no good distinguishing morphological characters to set it apart as a separate taxonomic entity, and little of a definitive nature may be stated regarding the possibility of admixture of genes—(perhaps) from *C. Spruceana*—until much more field work is carried out. It is interesting to note that *Allen 3068* very closely approaches the type in the size and shape of the leaves. The leaves of this collection are somewhat smaller than those of the Spruce material; those of the several Baldwin collections tend to be somewhat larger. In no specimens of *Cunuria crassipes* are we able to find traces of large foliaceous stipules. It is probable that these do not occur in this species, or, if they do occur, they are extremely caducous. All information indicates that the buttress roots are much smaller in *Cunuria crassipes* than they are in *C. Spruceana*, and the former is generally a much smaller tree than the latter.

The epithet *Cunuria crassipes* is being conserved, in conformity with Recommendation XIV of the International Rules of Botanical Nomenclature, over the earlier *Clusiophyllum Sprucei*. Were the indicated combination to be made, a new name would enter into the taxonomic literature. This name would be unfortunate because of its resemblance to *Cunuria Spruceana*, and endless confusion would be the result. In this connection, it should be noted that the name *Clusiophyllum Sprucei* was based upon *Spruce 3029* and *3474*. Although

these two collections were, in the early period of investigation of the genus, referred to *Cunuria Spruceana*, there is no justification for Pax's citation of *Clusiophyllum Sprucei* as a synonym of *C. Spruceana* (Engler Pflanzenr. IV. 147 (Heft 42) (1910) 16).

Little is known about the latex of *Cunuria crassipes*. In *Allen 3068*, it was "yellowish, scant, coagulating to a non-elastic gum"; while in *Baldwin 3673* and *3675*, the color of the latex is reported to be white.

In the opinion of the writers no known species of *Cunuria* appears to be promising as a commercial latex plant.

3. **Cunuria glabra** *R. E. Schultes sp. nov.*

Arbor monoecia, usque ad 75 pedes alta, radicibus cum tabularibus. Folia valdissime coriacea, perfecte ovata vel rarenter elliptico-rotundata, omnino glaberrima, in specimine typico 18–21 cm. longa, 12–13 cm. lata (in speciminibus aliis multo minora: 10–16 cm. × 8–11.5 cm.), apice rotundata vel rarenter obscurissime subacuminata, basi rotundata vel subcordata, valde marginata, supra brunnea vel glauco-brunnea, venis omnino (praecipue superfice inferiore) conspicue elevatis, secundariis octo arcuato-adscendentibus, sub marginem ipsum tenuiter anastomosantibus, tertiis prominentibus reticulatis subparallelis, glandulis comparate magnis. Petiolus crassissimus, sicco striato-fibrosus, 3.5–4 cm. longus, 4 mm. crassus. Inflorescentia subapicalis, laxa sed pedicellis rigidis crassisque, parce et minute adpresso-tomentellis. Flores staminati alabastro subglobosi, 2 × 3 mm. in diametro, calycibus ovatis, usque ad 5 mm. longis, 3 mm. latis, concavis. Florum pistillatorum calyces similes sed crassiores majoresque, 6 mm. longi, 4 mm. lati. Bracteae magnae, concavae, ovatae, 6 mm. longae, 4 mm. latae. Fructus (*Pinkus 236*) vivo usque ad 5.5 cm. longus, 3

cm. latus, endocarpio tenuissimo, epicarpio tenui ut videtur, glabro, pedunculo robusto usque ad 8 cm. longo.

Dutch Guiana: Tafelberg (Table Mountain). "Common tree 25 m. tall, 40 cm. diam., rooting at base to 2 m.; scant white latex oxidizing to yellow, leaves chartaceous; fl. white; dom. high tree, north of savanna 2." *Bassett Maguire 24279*, August 10, 1944 (Typus Herb. Arn. Arb.).

British Guiana: Membaru Creek, upper Mazaruni River, "Tree in mixed forest, 70 ft. high; trunk 16 in. diam.; latex white; fruit green without, white within; seed edible." *Albert S. Pinkus 236*, February 16, 1939. (Herb. Arn. Arb.; U.S. Nat. Herb. 1776073; Herb. Mo. Bot. Gard. 1175213, 1175214; Herb. Field Mus. 1001560; Herb. N.Y. Bot. Gard.; U.S. Nat. Arb. Herb. 156385).

It would appear that *Cunuria glabra* is allied to *C. Spruceana*. Croizat (in Bull. Torr. Bot. Club 57 (1940) 289) cited *Pinkus 236* as representing *Cunuria Spruceana*. He pointed out, however, that the specimens "have slightly larger leaf blades which are truncate or fairly cordate at the base and larger capsules to 6 cm. long."

When sufficient material is amassed, it is at once evident that *Cunuria glabra* is distinct from *C. Spruceana*. Besides the size and shape of the leaves, there are important differences in the texture and margin; in *Cunuria glabra* the leaves are extremely thick, coriaceous and very conspicuously marginate. The floral bracts are relatively large in *Cunuria glabra*, the flowers are extraordinarily large, and the petioles are very thick and rigid.

4. **Cunuria Spruceana** *Baillon* in Adansonia 4 (1863–64) 288; Mueller Argoviensis in Martius Fl. Bras. 11, pt. 2 (1874) 510, t. 14; Corrêa Diccion. Pl. Uteis Bras. 2 (1931) tab. on p. 482; Le Cointe A Amazonia Bras. 3 (1934) 145.

"*Micrandra et Pogonophora ? Cunuri* H. Bn. ol. in exs. Spruce" in Adansonia 4 (1863–64) 288.

Micrandra Cunuri Baillon ex Mueller Argoviensis in DC. Prodr. 15, pt. 2 (1866) 1123.

Brazil: Estado do Amazonas—Foz do Uaupés. "*Cunurí da terra firme.* 60 ft. bole above 6 ft. buttress to crown rising 30 ft. and with 30 ft. spread. Wood fairly soft; sample of this tree in Harvard wood collection. Seeds eaten by natives; see Spruce for preparation. With *Hevea* and *Monopteryx* in unflooded forest. Chromosomes: $2n=36$." *J. T. Baldwin Jr. 3683*, March 13, 1944. (Herb. Gray; Herb. Instit. Agron. Norte; U.S. Nat. Herb.; Herb. Kew.)—Serra Comande, Umarituba (above Santa Isabel). "*Cunurí da terra firme.*" *J. T. Baldwin Jr. 3689*, March 22, 1944. (Spec. cum fructu unico: Herb. Arn. Arb.; Herb. Instit. Agron. Norte; U.S. Nat. Herb.)—São Paulo de Olivença. "Mata. Arvore grande. *Cunurí.*" *Ricardo de Lemos Fróes 20752*, April 1945 (U.S. Nat. Arb. Herb. 182190, 182204).—Porto Curucuí, São Gabriel, Rio Negro. "Terreno silicoso, beira rio nao inundavel." *Ricardo de Lemos Fróes 21129*, Oct. 9, 1945. (U.S. Nat. Arb. Herb. 182193, 182205).

Colombia: Comisaría del Vaupés—Río Papurí, vicinity of Santa Teresita. "Tall trees averaging 35 m. in height, and 80 cm. in diameter above the conspicuously developed and unique stilt buttresses which are produced to a height of 3–4 m. as laterally compressed board-like flanges which act as flying buttresses, the bases widely detached from the trunk, the arch often high enough for a man to walk upright beneath. Leaves simple, with two basal disk-like glands. Inflorescence of small green flowers from axillary growth. Large trispermate capsule typical of *Hevea*. Bark very thin, 6–8 mm., with scanty latex which coagulates with difficulty, producing a non-elastic gum. Seeds collected by the local Indians for food. Known as "*wah-puh*" (Tukano)." *Paul H. Allen 3063*, August 15, 1943. (Herb. Gray).

Peru: Departamento de Loreto—Mishuyacu, near Iquitos, alt. 100 m., forest. "Tree 15 m. high, fl. light yellow." *G. Klug 1312*, May–June 1930. (Herb. Field Mus. 627499).—"Tree 20 m. high; fl. yellow." *G. Klug 1325*, May–June 1930. (Herb. Field Mus. 627508).—"Tree 18 m. high; fl. white." *G. Klug 340*, October–November 1929. (Herb. Field Mus. 624153).

Venezuela: "Cunurí, ling Barré. Arbor vasta, 100–140 pedalis lactescens, in radicibus exsertis late arcuatis suffulta. Pericarpium externum subcarnosum. Ad Casiquiarem, in sylvis. Jan. 1853. Per partes superiores fluviorum Nigri et Pacimonis ut etiam per totum fluv. Uaupés vulgata." *Spruce 3299* (Herb. Kew (two specimens); Herb. Brit. Mus.; Herb. Univ. Cambr.)—"Ad flumina Casiquiari, Vasiva et Pacimoni. *Cunurí.*" *Richard Spruce 3299*, 1853–54. (Typus) (Herb. Gray; Herb. N.Y. Bot. Gard. Photo spec. Herb. Geneva).

In addition to the specimens cited above, we may refer to several collections from the Río Caquetá drainage area in eastern Colombia. These collections—*Schultes 5869* and *5989* from the slopes of Cerro de La Pedrera and *Schultes 5895* and *5932* from the Río Miritiparaná—were studied in the field, and critical notes, written in the field, were published (Schultes in Caldasia 3, no. 13 (1945) 247–249). Although the specimens, together with several hundred others from the same region, were unfortunately lost in shipment, there is no question about the identity of these four collections. The fruit was very large, 6 cm. long or longer, and was, in all specimens, a perfect match for the fruit of *Baldwin 3689*. A photograph of the typical enormous buttressed roots was likewise published (*loc. cit.* fig. p. 248). Along the lower Caquetá and Miritiparaná rivers, especially in the vicinity of the town of La Pedrera (an important Martius type locality formerly known and cited as "Cupatí"), *Cunuria Spruceana* is one of the dominant trees on high land, especially where there are rock outcrops. The Miraña Indians know the tree as *ko-nó-ko;* the Yukunas as *yé-cha.* Schultes (*loc. cit.*) reported: "Where it occurs in the lower Caquetá, Colombia, it is abundant, in some places. . . . crowding out other common forest trees and forming pockets of almost pure stands. It does not occur over wide extensions, but seems to be localized in swampy or well-watered areas where rock outcrops (sandstone as well as granite) are frequent."

Martius apparently did not collect this species in the Cupatí locality, where it is so well represented, because he happened to pass in the interim between the flowering and the fruiting season—in January and February (see Dugand in Rev. Acad. Colomb. Ciénc. Exact. Físic. Nat. 5, no. 18 (1942) 212 ff.). Ducke, who collected rather extensively in this same locality in late 1922, ap-

parently did not collect *Cunuria Spruceana*, although it should have been in flower at the time (Ducke in La Géograph. 30 (1914–15) 365–372). This serves to indicate the extremely localized and disrupted occurrence of the species, a phenomenon which has been noted in other regions for this as well as for other species of *Cunuria*.

A large tree probably representing *Cunuria Spruceana* was observed by Schultes in numerous discontinuous localities in the lower Río Apaporis in eastern Colombia (Schultes in Chron. Bot. *loc. cit.*) during a survey of *Hevea* rubber which was made along that river in 1943.

Cunuria Spruceana is an important food plant of many Indians, for the seeds, like those of *Hevea*, are a favorite food when properly prepared. Spruce (in Hook. Journ. Bot. 6 (1854) 333–337) reported that from the seeds of "*cunurí*, abundant on the Alto Rio Negro, Orinoco, Casiquiare, Pacimoni, etc. the Indians prepare a paste resembling cream-cheese in appearance and taste. The seeds are first boiled and then steeped for some days under water, after which they are broken up by the hand. In the boiling, a quantity of oil is said to be collected; . . . . it is said to be as bitter as andiroba oil, but to afford an excellent light." There is a handwritten notation on the herbarium specimen at Kew which gives much greater detail concerning the native uses of the seeds of *Cunuria Spruceana:* "On the Uaupés and around São Gabriel, a large tree, obviously allied to *Siphonia* [*Hevea*], called by the Indians *Cunurí* is frequent in the forest. It has large arched buttresses at the base, like the uacu [*Monopteryx Uaucu* Spruce ex Benth.], from which it is distinguished by milk flowing from it when wounded. I have not yet seen its flowers or fruits, but the Indians describe the latter as tricoccous, quite as in *Siphonia*, and they use the seeds in a similar manner. These being boiled 24 hours yield a small quantity

of oil, which serves for lamps. The pulpy mess into which the seeds have now fallen is packed in a basket and kept under water 3 days to sweeten; when taken out, it has a pleasant taste and no ill smell. It is eaten without the addition of anything else and may be kept a long time, but if the seeds have not been well boiled, it is a quick poison, and Indians have fallen victims to its incautious use." Schultes found the Indians of the lower Caquetá in Colombia similarly utilizing *Cunuria Spruceana* as a food, and stated (*loc. cit.*) that the seeds "apparently contain a cyanide and, according to the natives, are extremely poisonous when taken internally in the crude state." The Indians there "consume large quantities of the seeds in the form of a greyish mash which is prepared by boiling the pulp in three waters to remove the poison. This mash has a peculiar taste, somewhat like burnt potato. According to the natives, salt must not be added to this mash." Ducke reported this use for Indians of the Rio Negro (in Le Cointe *loc. cit.*). *Allen 3063* records a comparable use by the natives of the Río Papurí, an affluent of the Vaupés which forms part of the Colombo-Brazilian boundary. And, in 1944, Baldwin found the seeds used, just as reported in 1853 by Spruce, in the upper Rio Negro–Rio Uaupés region.

Cunuria Spruceana was the first species of the genus to be described. An extended description appeared in Flora Brasiliensis. The only two illustrations of *Cunuria* have been of this species; the second is a poor copy of the first which was published in Flora Brasiliensis. Probably because of this emphasis on one species, collections of *Cunuria* have almost always been referred to *C. Spruceana.* This has led to the erroneous assumption that *Cunuria Spruceana* is more widely distributed than it really is. As we interpret it, this species occurs, discontinuously, in an arc or crescent from the Casiquiare and

Rio Negro southwestward across the easternmost portion of the Colombian Amazonía to a locality near Iquitos in eastern Loreto, Peru, and to the upper Solimões in Brazil. The Peruvian specimens which are here referred to *Cunuria Spruceana* are slightly atypical in a number of minor characters of the flowers and in having stipules which are not readily caducous. In some respects, it would seem that the Peruvian specimens are somewhat intermediate between typical *Cunuria Spruceana* and *C. Spruceana* var. *bracteosa.* Until more collections are available from this westernmost station for the genus, we feel that it is unwise to interpret these variations as representing a distinct taxonomic concept.

5. **Cunuria Spruceana** *Baillon* var. **bracteosa** (*Ducke*) *R. E. Schultes comb. nov.*

Cunuria bracteosa Ducke in Notizbl. Bot. Gart. Berlin 11 (1932) 586, *in synon.*; in Arch. Jard. Bot. Rio Janeiro 6 (1933) 57.

Brazil: Estado do Amazonas—Rio Solimoes, Sao Paulo de Olivença. "Frecuens. Silva non inundabili, saepius locis humidis vel ad rivulos. Arbor maxima, flor. albido-viridibus." *A. Ducke Herb. Jard. Bot. Rio 23519*, August 20, 1929 "florif., fructus maturi tempore pluvioso." (Typus). (U.S. Nat. Herb. 1516538, 1517678; Herb. Jard. Bot. Rio; Herb. Kew).— Rio Negro super ostium flum. Curicuriary. "Silva non inundabili. Arbor magna radicibus tabularibus magnis, flor viridibus." Nom vulg. *Cunury. A. Ducke Herb. Jard. Bot. Rio 24873*, December 24, 1931. (U.S. Nat. Herb. 1617664; Herb. Jard. Bot. Rio 24873; Herb. Kew).—Manáos, estrada do Aleixo. "Silva non inundabili, prope rivulum. Arbor magna; flores masculi albi, odore ut in *Hevea.*" *A. Ducke Herb. Jard. Bot. Rio 24874*, December 18, 1941. (U.S. Nat. Herb. 1617665; Herb. Jard. Bot. Rio 24874; Herb. Kew). —Manáos. "Matta da t. f. silicoso-humosa, loga humido perta d'um riachinho. Arv. gr. com sapupemas altas, latex branca, fl. masc. bracacenta com cheiro que lembra *Hevea.*" Nom. vulg. *cunurí. A. Ducke 77*, June 1932. (Yale School Forestry Mus. Ser. 21336; Herb. Field Mus. 657675).— Rio Negro, Sao Gabriel. "Silva non inundabili. Arbor magna flor. viridibus." Nom. vulg. *cunurí. A. Ducke 146*, February

16, 1936. (Herb. Arn. Arb.; Herb. Field Mus. 902328; Herb. Mo. Bot. Gard. 1158515; Herb. N.Y. Bot. Gard.; U.S. Nat. Herb. 1693155, 1694262; Herb. Jard. Bot. Rio 35437; Herb. Kew).—Manáos, Estrada do Aleixo. "Silva non inundabili. Arbor magna floribus albidis." *A. Ducke 848*, December 18, 1941. (Herb. Mo. Bot. Gard. 1255541; U.S. Nat. Herb. 1875676; U.S. Nat. Arb. Herb. 167007).—Manáos, Igarapé do Crespo. "Ad marginem igapo. Arbor magna floribus albidis. *A. Ducke 1087*, December 12, 1942. (Herb. Mo. Bot. Gard. 1263939; U.S. Nat. Herb. 1832363; U.S. Nat. Arb. Herb. 167008, 167009).—Tonantins. "Mata da terra firme, logar umido. Arvore muito grande; flor. brancaçenta. Arbor maxima floribus albidis." *A. Ducke 1554*, February 10, 1944. (Herb. Arn. Arb.; U.S. Nat. Herb, 1906514; U.S. Nat. Arb. Herb. 167213).—Manáos. "Arvore. Mata." *Ricardo de Lemos Fróes 20505*, Feb. 22, 1945 (U.S. Nat. Arb. Herb. 182200).—Sao Paulo de Olivença. "Mata, caatinga. Arvore." *Ricardo de Lemos Fróes 20697*, April 1945. (U.S. Nat. Arb. Herb. 182201).

Cunuria Spruceana var. *bracteosa* is one of the most widespread concepts of the genus. It is found in the upper Rio Negro in close proximity to *Cunuria Spruceana;* it is apparently frequent in the vicinity of Manáos; and it is known from the Rio Solimões. On the highland forest floor near San Pedro on the Rio Içа (Putumayo), between the Colombian boundary and the mouth of the river, Schultes, in 1946, saw fruit and seed of what apparently is *C. Spruceana* var. *bracteosa.* This is the westernmost known locality for the variety.

Cunuria Spruceana var. *bracteosa* is very easily recognized and separated from *C. Spruceana* by having remarkably large floral bracts and large foliaceous stipules which are extremely persistent. In herbarium specimens, the leaves of the variety invariably dry a glossy straw-color, while those of the species always turn a dull, dark brown. Furthermore, the nerves of the former are yellow when dry and are not elevated; those of the latter are dark brown when dry and are very prominently elevated. The capsule and seed of var. *bracteosa* are very

similar to, but always smaller than, those typical of the species itself; the capsule usually measures about 4 cm. long.

Ducke published *Cunuria bracteosa* in 1933, but a year previously he had said (in Notizbl. *loc. cit.*) that "zu dieser Art [*C. Spruceana*] gehört wohl sicher das Herbarmaterial das unter dem Namen *Cunuria bracteosa* nov. spec. von mir verteilt wurde; wahrscheinlich ist übrigens diese Gattung monotypisch." It is obvious that Ducke continued to regard his species, *Cunuria bracteosa*, as synonymous with *C. Spruceana*, because his more recent collections of the former concept have all been determined by him as representing the latter, and, in 1934, he reiterated his opinion that *C. bracteosa* should be regarded as a synonym of *C. Spruceana* (in Arq. Instit. Biol. Veget. Rio Jan. 1, no. 2 (1934) 91, footnote 1).

A letter from Ducke (April 1932) attached to *A. Ducke 23519* in the Kew Herbarium states: "I distributed the *no. 23519* with the name *Cunuria bracteosa* n. sp. (São Paulo de Olivença, Solimões River), but lately I collected similar material on the upper Rio Negro, typical region of *Cunuria Spruceana*. *Cunuria bracteosa* differs of the description of *Cun. Spruceana* by bracteae well developed and by the glandulae of the *exterior* of the male flowers receptacle, but I now presume that Spruce did not collected material in good conditions and that the *Cunuria* might be only of one single species. Still, I dare to say that the flowers as well as the capsules and seeds may vary in size on the same tree enormously. Consequently, I resolved not to publish meanwhile my supposed new species."

VI

CONCEPTUS EXCLUDENDI:

Anomalocalyx Uleanus (*Pax et Hoffman*) *Ducke*

in Notizbl. Bot. Gart. Berlin 11 (1932) 344; in Arch. Jard. Bot. Rio Janeiro 6 (1933) 60, tab. 6, fig. 8.

Cunuria Uleana Pax et Hoffman in Engler Pflanzenr. IV. 147. XIV (Heft 68 in part) (1919) 51.

When Pax and Hoffman described this concept and referred it to *Cunuria*, they had only fruiting material at hand. From flowering and fruiting material which he had collected at the type locality, Ducke described the genus *Anomalocalyx* to accommodate the concept which, up to that time, had been accepted as *Cunuria Uleana*. We are in agreement with Ducke that this genus has no relationship with *Cunuria*. A study of the remarkably complicated flowers of *Anomalocalyx Uleanus*, well figured by Ducke, indicates this fact. The structure and texture of the capsule likewise substantiates such a conclusion.

Cunuria ? casiquiariensis *Croizat* in Journ. Arnold Arb. 26 (1945) 192.

When Croizat described this concept, placing it with reservation in *Cunuria*, he stated clearly: "*Cunuria* is suggested by the intangibles of habit and the characters of the foliage, but the inflorescence is somewhat unconventional." The inflorescence would appear to diverge so widely from that which is usual for *Cunuria*, that we feel that this plant cannot be included, even provisionally, in the genus. For several valid reasons, Croizat has excluded it from *Conceveiva* and *Concevastrum*. In many respects, it suggests *Pogonophora*, but the lack of staminate flowers makes it impossible to be certain of proper generic reference. In a number of other respects, it is extremely similar to *Micrandra*.

Cunuria Gleasoniana *Croizat* in Bull Torr. Bot. Club 57 (1940) 289.

The presence of a definite caruncle on the seed of this concept renders its inclusion in *Cunuria* untenable.

VII

The authors wish to express their appreciation to the following institutions for the loan of material and for other courtesies: Arnold Arboretum, and Gray Herbarium of Harvard University; Missouri Botanical Garden; Chicago Museum of Natural History; New York Botanical Garden; Yale School of Forestry; U.S. National Herbarium and U.S. National Arboretum Herbarium. The authorities of the Jardin Botanico de Rio de Janeiro and the Herbario do Instituto Agronômico do Norte in Belem do Pará, both in Brazil; the British Museum (Natural History) and the Royal Botanic Gardens, Kew are thanked for their kindness in permitting the specimens in their care to be studied.

EXPLANATION OF THE ILLUSTRATIONS

PLATE XLII. CUNURIA AUSTRALIS *R. E. Schultes.* 1, terminal branch, one half natural size. 2, two valves of the capsule, natural size.

Drawn by G. W. DILLON

PLATE XLIII. CUNURIA CRASSIPES *Muell. Arg.* 1, terminal branch, one half natural size. 2, two valves of the capsule, natural size. 3, seed, natural size.

Drawn by G. W. DILLON

PLATE XLIV. CUNURIA GLABRA *R. E. Schultes.* 1, terminal branch, one half natural size. 2, two valves of the capsule, natural size. 3, staminate flower, four times natural size.

Drawn by G. W. DILLON

PLATE XLV. CUNURIA SPRUCEANA *Baill.* 1, terminal branch, one half natural size. 2, two valves of the capsule, natural size. 3, seed, natural size. 4, pistillate flower, four times natural size.

Drawn by G. W. DILLON

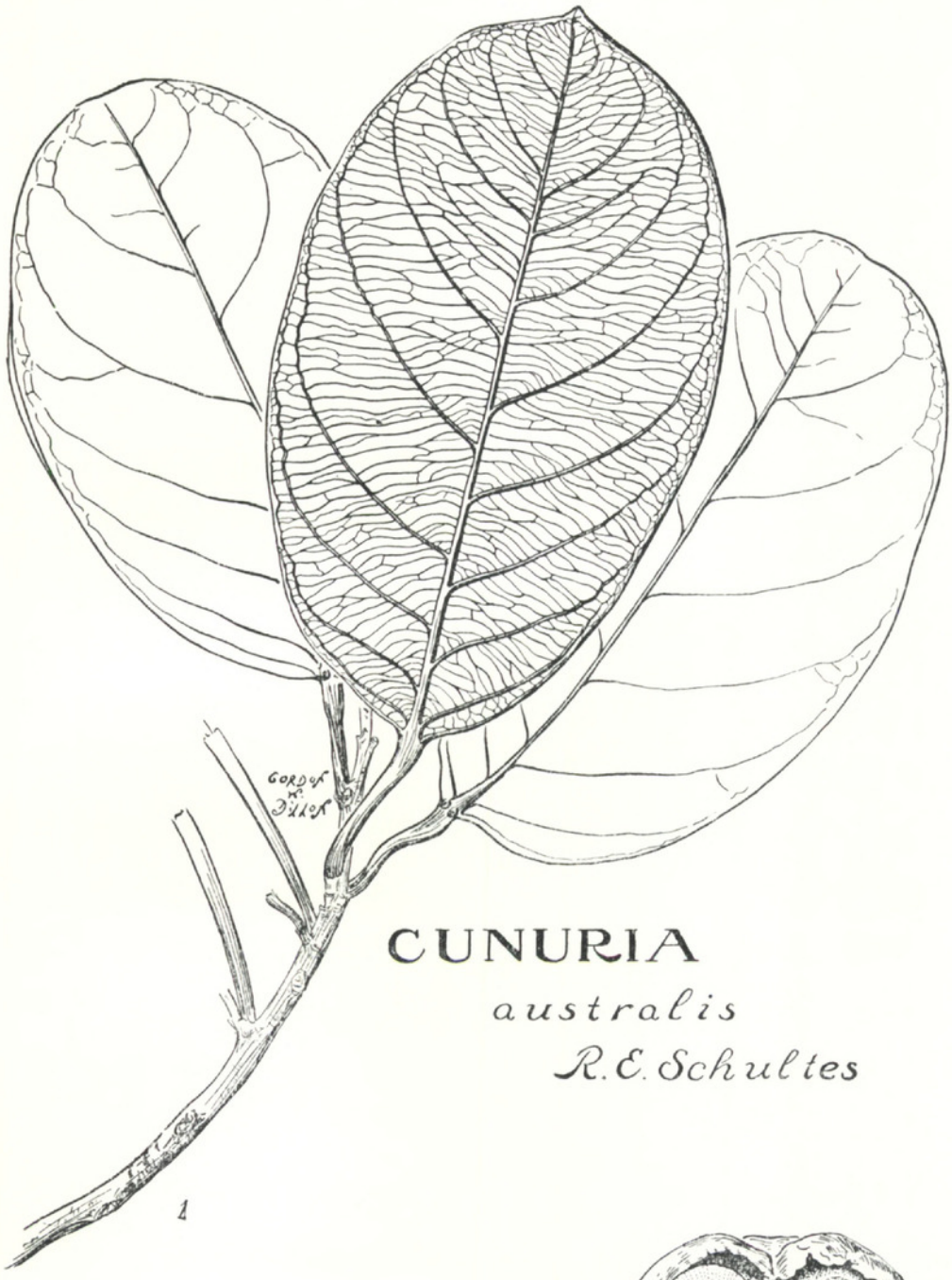
PLATE XLVI. CUNURIA SPRUCEANA *Baill.* var. BRACTEOSA (*Ducke*) *R. E. Schultes.* 1, terminal branch with inflorescence, one half natural size. 2, two valves of the capsule, natural size. 3, seed, natural size. 4, pistillate flower, four times natural size. 5, staminate flower, four times natural size.

Drawn by G. W. DILLON

PLATE XLVII. CUNURIA SPRUCEANA *Baill.* Photograph taken at La Pedrera, Colombia, showing the enormous buttress roots so characteristic of the species.

Photograph by R. E. SCHULTES

PLATE XLII



CUNURIA

australis

R. E. Schultes

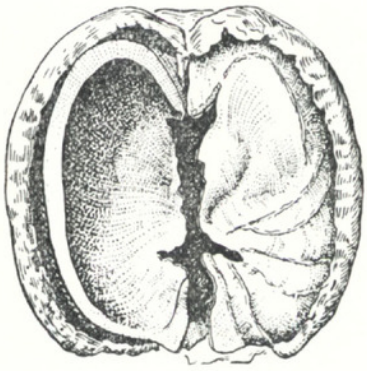


PLATE XLIII

CUNURIA

crassipes Muell. Arg.

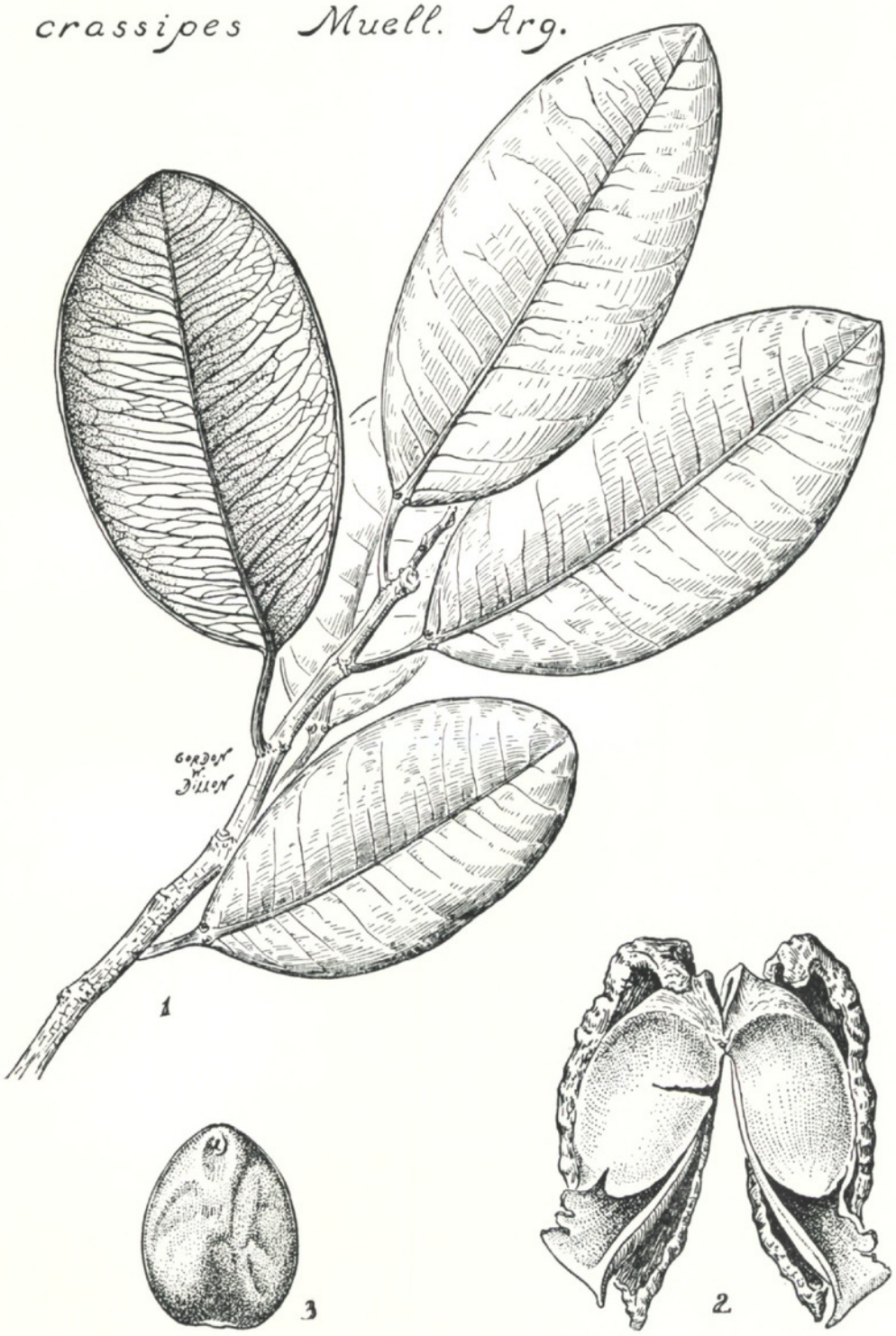
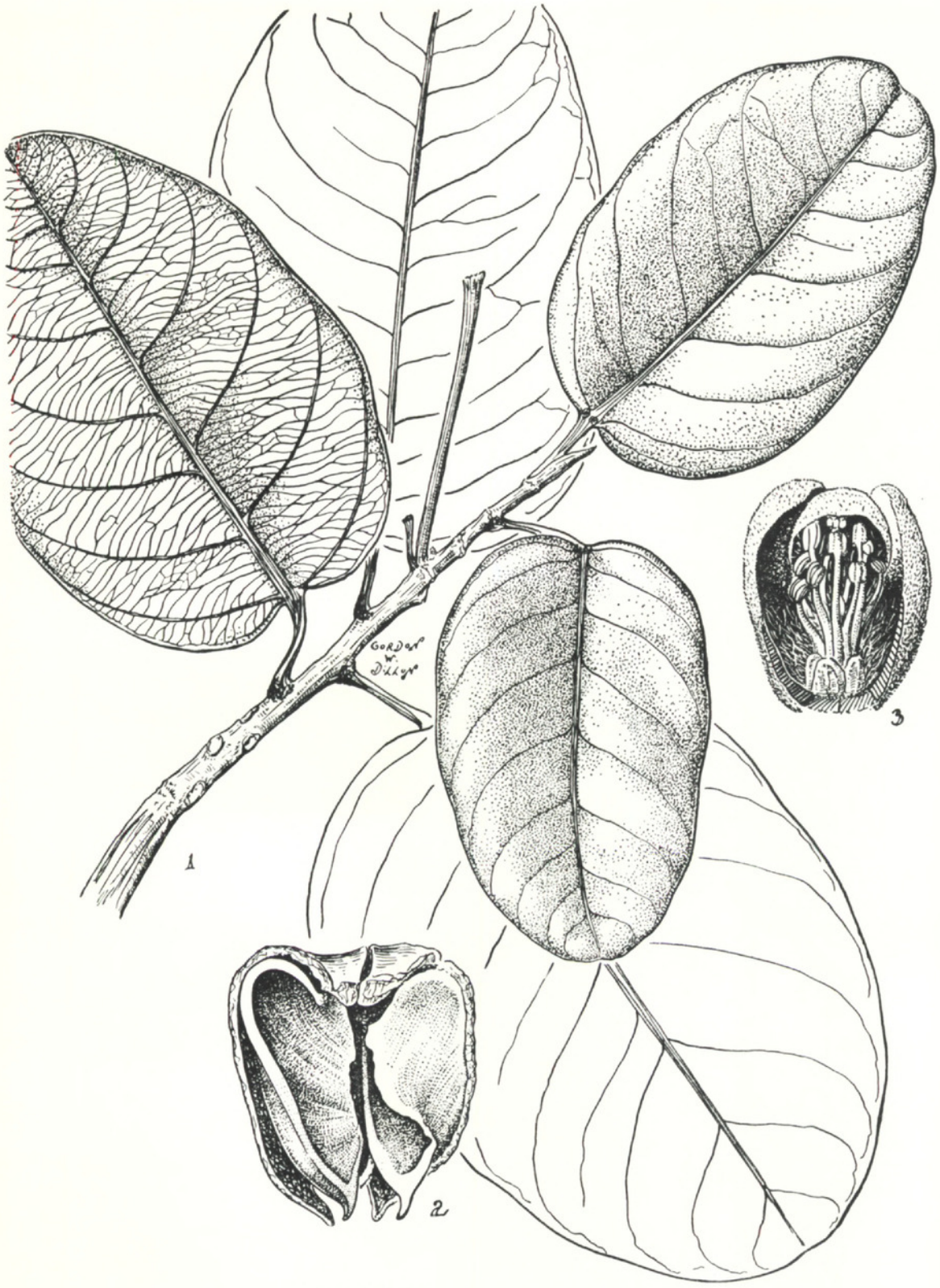


PLATE XLIV



CUNURIA

glabra R. E. Schultes

PLATE XLV

CUNURIA

Spruceana Baill.

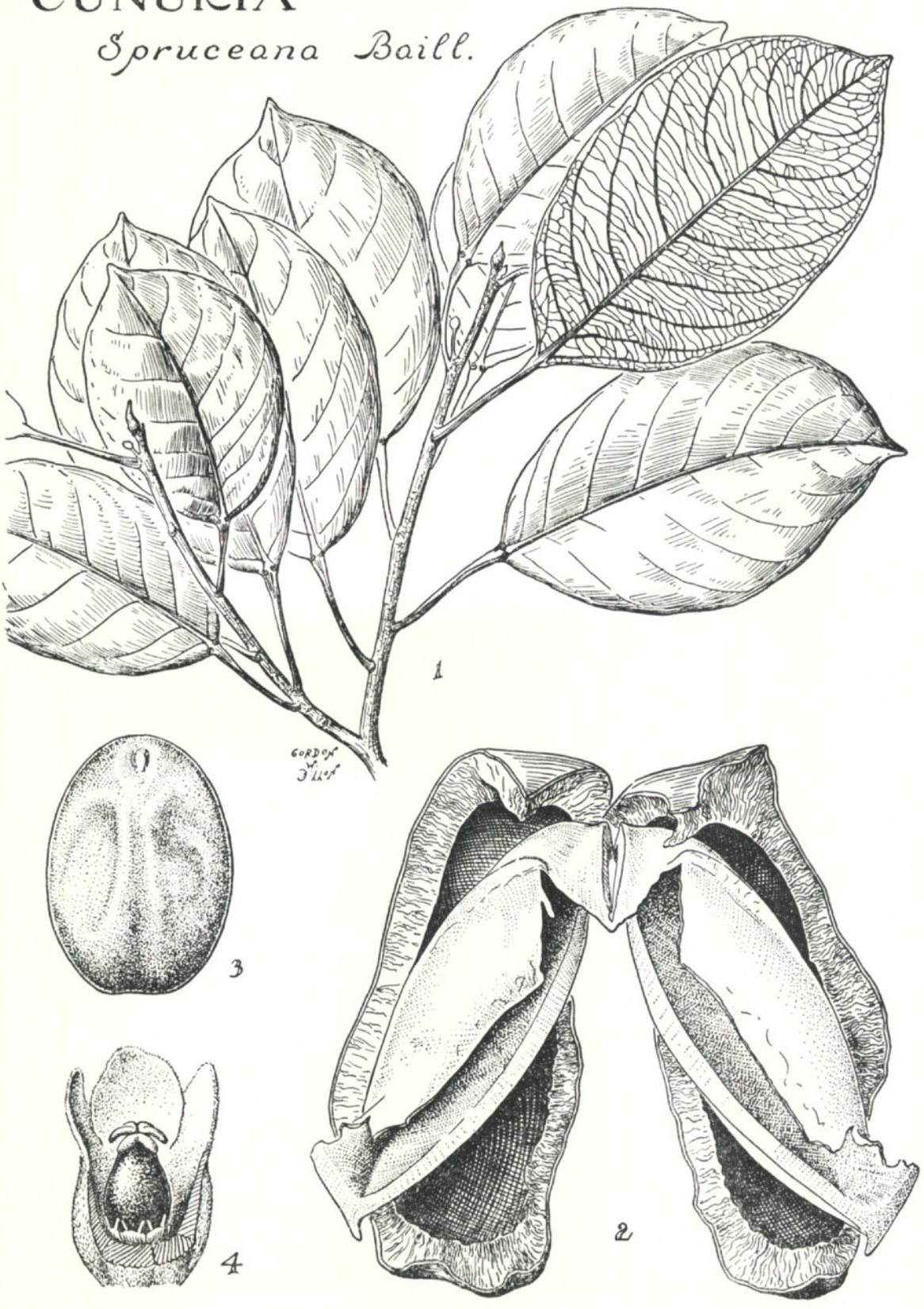


PLATE XLVI

CUNURIA

Spruceana Baill.

var. bracteosa (Ducke) R.E. Schultes

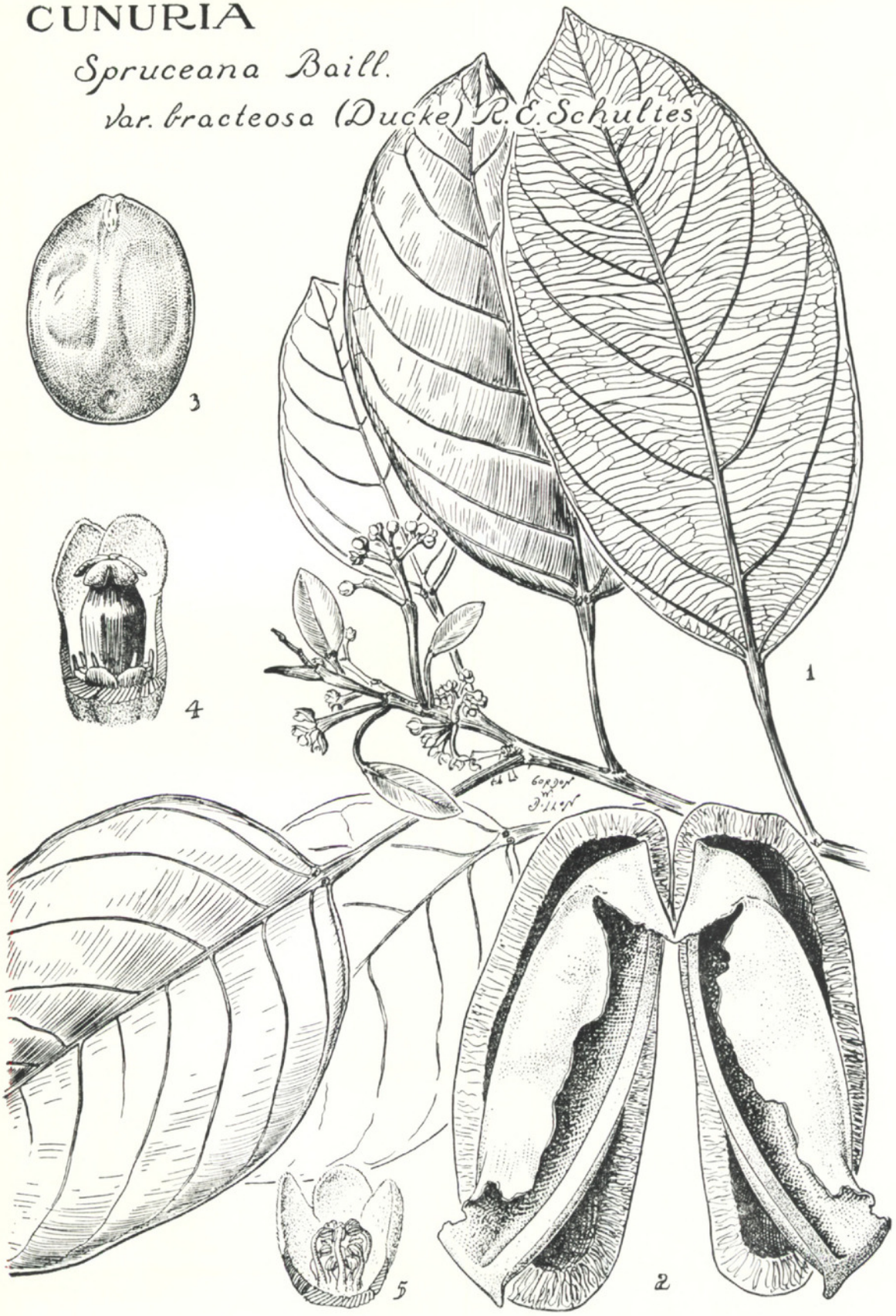


Plate XLVII