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STUDIES IN THE GENUS HEVEA IV

BY
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NOTES ON THE RANGE AND VARIABILITY OF HEVEA MICROPHYLLA

LITTLE has been known about the range and variability of *Hevea microphylla*. This was due partly to the scarcity of collections referable to *Hevea microphylla* and partly to an unfortunate confusion of this species with an entirely distinct concept.

THE DISTRIBUTION OF HEVEA MICROPHYLLA

Until recently, the binomial *Hevea microphylla*, published by Ule in 1905 on the basis of material from the middle Rio Negro, has been considered to be synonymous with *H. minor* Hemsley, a name published six years previously for material from the Casiquiare of Venezuela which, upon preliminary field examination, would appear to be identical with the concept described as *H. pauciflora* (Spruce ex Bentham) Muell.-Arg. var. *coriacea* Ducke.

I was fortunate in being able to examine type and other authentic material of *Hevea* at the Royal Botanic

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Gardens at Kew in 1947. This study led to the discovery that *Hevea microphylla* and *H. minor* are wholly distinct and unrelated concepts (cf. Bot. Mus. Leafl. Harvard Univ. 13 (1947) 1–9). Following my trip to Kew, I spent nearly a year in the Rio Negro basin of Brazil and Colombia investigating, amongst other problems, the differentiation of these two concepts. Material was examined and collected from the type localities, and this was compared with abundant material from other regions. This field research fully corroborated the conclusions drawn from the previous study of herbarium material.

During my stay in the Rio Negro area, it was possible to see many hundreds of trees of *Hevea microphylla* (prior to 1947 known only from the type locality and one nearby station) from the middle Rio Negro to its headwaters and in a number of its affluents. Our knowledge of the range of this most distinctive of all species of *Hevea*, hitherto, to all appearances, a highly restricted endemic, is now much more extensive.

As stated above, until recently *Hevea microphylla* has been confused with *H. minor*. This has contributed to a misunderstanding of its range. Even had this confusion not been so firmly established in the literature, the few available collections of *Hevea microphylla* would have been rather difficult to interpret from a phytogeographical point of view. Furthermore, while sometimes correctly located by earlier writers (e.g., Reintgen, P. "Die Geographie der Kautschukpflanzen" (1905) 23), the concept has often been erroneously attributed in the literature to areas, such as the Acre (de Souza Carneiro, A. J. "Rubber in Brazil" (1913) 8), which are far distant from where it actually does occur.

In 1903, two years before Ule's description of *Hevea microphylla*, H. Jumelle ("Les plantes a caoutchouc et a gutta (1903) 123) published a note on a specimen of

seringueira barriguda with a "conic" fruit. The specimen was collected by M. Bonnechaux on the Rio Caurés, an affluent of the middle Rio Negro below Barcellos. This species, two fruits of which were illustrated (Jumelle loc. cit., fig. 16), is, without any doubt, ***Hevea microphylla.*** Jumelle reported that it had a very small fruit with "papyraceous" valves "2 millimeters thick" and seeds which are rather long and slightly triangular, measuring 14 mm. across at the base, 11 mm. at the point of attachment, and 25 mm. in length. This is, so far as I have been able to ascertain, the earliest report of ***Hevea microphylla.***

The type of ***Hevea microphylla,*** a fruiting specimen, was collected in 1902 on the Ilha de Xibarú near São Joaquím in the middle Rio Negro, slightly above the town of Barcellos. In 1905 (?), Ducke collected flowering material (the flowers of which were described by Huber as representing *Hevea minor*) near Barcellos. A quarter of a century later, in 1931, Ducke secured flowering material from the type locality. Until recently, these were the only collections of ***Hevea microphylla*** available. It seemed as though this species, which in a third of a century had been collected only a few times and in one very small area, represented one of the most highly restricted endemics of the genus.

In May 1937, Mr. Charles H. T. Townsend, Jr., then director of the Ford plantations on the Rio Tapajóz, introduced ***Hevea microphylla*** into cultivation from the Rio Negro. There are, at the present time, four selections of this species growing at the Belterra plantations. ***FM*** *1516* and ***FM*** *1517* were collected on an island in front of the settlement of Cumarú, below Barcellos. This locality is the southernmost station known for the species. ***FM*** *1518* and ***FM*** *1519* are selections from trees found along a creek back of Barcellos. All were prop-

agated from budwood. When I saw *Hevea microphylla* at Belterra in September 1948, it appeared to me to show rather slow growth as compared with *H. Benthamiana* and *H. Spruceana* which had been introduced from the same general area and which occur naturally in sites which are ecologically similar to those occupied by *H. microphylla.* At Belterra, of course, the material was budded on root-stocks, presumably of *Hevea brasiliensis*, growing on a high, well-drained plateau.

The recent trips of Senhor Ricardo de Lemos Fróes to the Rio Negro have extended our knowledge of the range of *Hevea microphylla.* Several of his collections, cited below, are referable to this concept. *Fróes 812*, collected in 1942, is stated to have been found in the "middle Rio Negro, 600 miles . . . from Manáos" and *Fróes 812B* in the Rio Enuixí, in the Municipality of São Gabriel, much farther upstream, near Tapurucuara. In 1947 and 1948, Fróes secured material from the Rio Padauarí and the Rio Caurés, interesting affluents of the middle course of the Rio Negro.

In 1944, Dr. John T. Baldwin, Jr., who carried out cytogeographic studies of *Hevea* in the Amazon Valley, visited the Rio Negro. In an article on his interpretation of the genus *Hevea* (in Journ. Hered. 38 (1947) 54), he reported: "*H. minor* was found on the Rio Uaupés as a bottle-butted tree, at the Venezuelan border, as a treelet to 10 feet, and along the Rio Negro in estradas with *H. Benthamiana* and of stature comparable to that of representatives of *H. Benthamiana.*" Specimens of Baldwin's collections have been unavailable to me for study, but in conversation Baldwin has assured me that the tree to which he was referring in this statement represents the concept now known correctly as *Hevea microphylla.*

In October 1947, in company with Ing. Agron. João

Murça Pires of the Instituto Agronomico do Norte of Belém, I had an opportunity of visiting the type locality of *Hevea microphylla* — the Ilha de Xibarú — and of studying a number of trees, from some of which collections were made.

Later, during my stay in the Rio Negro basin, I encountered many hundreds of trees of *Hevea microphylla* at Piloto, near Barcellos, and along the Rio Negro, from a point slightly above the confluence of the Negro and the Uaupés to the mouth of the Içana, with an extraordinary concentration in the vicinity of the town of São Felipe, slightly below the mouth of the Içana. This species was also found to be present in surprising densities along the lower course of the Rio Içana and the Rio Xié. A botanically fascinating trip into the country of the Rio Dimití, an affluent of the left bank of the upper Rio Negro which penetrates completely unknown territory, brought to light *Hevea microphylla* in this river. Farther upstream in the Rio Negro, *Hevea microphylla* was found to be rather abundant along the inundated banks of the lowermost course of the Río Guainía, in both Colombian and Venezuelan territory. It was also collected in the Rio Curicuriarí, although it is not at all common there. Along the low flood-banks of the Igarapé da Chuva at Taracuá on the Rio Uaupés and along the lower portion of the Rio Tiquié, an affluent entering the Uaupés below Taracuá, *Hevea microphylla* forms one of the characteristic elements of the flora. In several other localities, especially on the islands in the Rio Uaupés and the middle Rio Negro, reports of the inhabitants indicated the presence of *Hevea microphylla*. Their accurate description of the fruit of this species, so different from that of all other Heveas, and the widely known common name of *seringueira tambaquí*, leave no doubt in my mind that these reports are reliable.

We may, then, on the basis of the collections and these reports (which, in many cases, are from points intermediate between the localities from which collections have been made), state that *Hevea microphylla* is endemic to the Rio Negro basin, ranging continuously, when ecological conditions will permit, from slightly below Barcellos up the Rio Negro to the confluence of the Casiquiare and the Río Guainía nearly to Maroa; possibly into the Casiquiare; in the lower reaches of most of the affluents of the middle and upper portions of the Rio Negro, such as the Içana, Xié, Dimití, Curicuriarí, Padaurí, Enuixí and Caurés; up the Rio Uaupés, especially on the islands, to Ipanoré (the first major rapids going upstream), possibly not beyond this point; and in the lowermost reaches of the affluents of the Uaupés. Formerly believed to be confined to Brazil, *Hevea microphylla* has now been found in both Colombian and Venezuelan territory.

Descriptions of Hevea microphylla

Hevea microphylla *Ule* in Engler Bot. Jahrb. 35 (1905) 669, tab. 1: fig. j, k, l, m; Ule in Kautschukgewinnung (Kolonialwirtsch, Kom. 1905) (1905) 10; Huber in Bol. Mus. Goeldi 4 (1906) 634 [non accurate, sub *Hevea minore*], 636; Pax in Engler Pflanzenr. 4, 147 (1910) 125; Ducke in Arch. Inst. Biol. Veget. 2, no. 2 (1935) 241, pro parte, tab. p. 246, a–f, 247, a–b [non accurate, sub *Hevea minore*]; Ducke in Bol. Técn. Inst. Agron. Norte, no. 10 (1946) 20, pro parte; Schultes in Bot. Mus. Leafl. Harvard Univ. 13 (1947) 1–9; Seibert in Ann. Mo. Bot. Gard. 34 (1947) 276, 285, 292, pl. 39; pl. 40, fig. 8; pl. 41, fig. 8; pl. 42, fig. 8; pl. 43, fig. 2.

Hevea microphylla Ule var. *typica* Pax in Engler Pflanzenr. 4, 147 (1910) 126.

Hevea microphylla Ule var. *major* Pax in Engler Pflanzenr. 4, 147 (1910) 126.

ORIGINAL DESCRIPTION:

". . . . foliis rigide membranaceis, pro proportione parvis, foliolis ovalibus, acuminatis, acutis, glaberrimis, sub basi petiolulorum glandulis distinctis munitis; floribus ignotis; capsulis triangulatis, trigonis subalatis, suturis parietalibus elevatis, acutis, striatis, laevibus, seminibus ovoideis, obsolete quadrangularibus, maculatis.

"Baum von ca. 8–18 m. Höhe mit feinerer Verzweigung; Blätter 8–14 cm. lang; Teilblätter 5–8 mm. gestielt, mit 2 schwärzlichen erhabenen Drüsen an der Ansatzstelle versehen, 60–70 mm. lang, 24–34 mm. breit, nach beiden. Enden verschmälert, dunkelgrün, unterseits etwas heller, deutlich geardert, etwas zugespitzt, spitz; Kapsel 40–50 mm. lang, 30–40 mm. dick, dreiekig und dreiseitig mit hervortretenden, fast geflügelten Kanten und mit erhabener Wandnaht, spitz, nach den dunkelgrün Kanten zu weissgrün gestreift; Samen von aschgraver Farbüng, dunkelbraun, unregelmässig gefleckt, von undeutlich vierseitiger, eiformiger Grundgestalt, 20–25 mm. lang und 12–15 mm. dick."

The earliest description of the flowers of *Hevea microphylla* is that of Huber (loc. cit.) who, however, referred it to *H. minor*.

"*Paniculae* e basi innovationum numerosae breves (petiolis foliorum inferiorum breviores) subsimplices, flore [femineo] singulo terminatae, caeterum flores masculinos in ramulis brevibus gerentes, glabrae. *Flores* masculini breviter pedicellati lutei extus albido-tomentelli vel subsericei, clausi ovoideo-lanceolati (4 mm. longi, 2 mm. crassi) longe acuminati (loborum apicibus contortis), aperti 5–6 mm. longi, 6–7 mm. diametro metientes, perianthio ad 2/3 longitudinis in lacinias ovato-lanceolatas

longe acutissimeque acuminatas diviso, *disco e glandulis 5 ovatis acuminatisque composito, columna staminali elongata glabra apice breviter trifida*, antheris 10 bi-verticillatis, verticillis demum distantibus antherisque irregulariter insertis. *Flores feminei* masculinis paulo maiores basim versus glabri, disco e squamis bilobis cum staminodiis alternantibus composito, *ovario subglabro in stylum brevem attenuato.*"

Study of the material now available has enabled me to prepare the following extended description:

Arbor parva vel mediocris, usque ad sexaginta pedes (sed saepissime minor) alta. Truncus basi valdissime incrassatus, plerumque 16–18 poll. in diametro, sursum abrupte in truncum columnarem et gracilem fastigans, latice albo aquosoque. Cortex plusminusve 7 mm. crassus, comparate mollis, ab cambio facile desquamans, extrinsecus laevis, spadici-brunneo, intus albo-straminellus. Rami graciles, hornotino incremento cortice laevissimo nitido et conspicue rufo obtecto, ramulis foliiferis cum annulo angusto cicatricibus foliorum squamellarum formato alternantibus. Petioli graciles, 2–6 cm. (plerumque 3–4 cm.) longi, circiter 1 mm. in diametro, teretes, cortice glabro et basin versus rubicundulo-brunneo, tenuiter striati, basi leviter dilatati, apice valde biglandulosi, glandulis nigrescentibus, turgidis, reniformibus confluentibus. Petioluli graciliores, 6–10 mm. (plerumque 9 mm.) longi. Foliola valde reclinata rarius horizontalia (vel horizontali-reclinata), vivo discoloria statu adulto tenuiter papyracea vel demum firme membranacea (numquam vivo subcoriacea), elliptica vel lanceolato-elliptica, basi rotundata vel satis abrupte attenuata, apice acuminata, emarginata, 5–16 cm. (plerumque 7–10 cm.) longa, 2–5 cm. (plerumque 2.5–3.5 cm.) lata, supra vivo atroviridia, subnitida, omnino glaberrima, infra pallidiora, glabra sed oculo armato magnopere minutissime albido-scobi-

culata; costis subtus elevatis, subtus conspicuis sed non elevatis, glabris, secundariis duodecim ad quindecim. Stipulae mox deciduae, subulatae, graciliores. Paniculae abbreviatae, quam folia multo breviores, aliquid rigidae, mediocriter floribundae, glabrae. Alabastra staminata longe conico-acuminata, 4–5.5 mm. longa, calycis segmentis apicem versus leviter contortis; pistillata paulo majora, subcylindrico-acuminatissima, 6.5–8.5 mm. longa, calycis segmentis apicem versus leviter contortis; utroque sexu segmentis apice ipso pubescentibus et non callosis. Flores breviter pedicellati, lutei, fragrantissimi (ut dicitur). Calyces crassiusculo-membranacei; staminati 4–7.5 mm. (plerumque 7 mm.) longi, vulgo per 3/5 longitudinis partem partiti, extus et intus tomentelli; pistillati plerumque 7.5–8 mm. longi, vulgo per 1/2 vel 3/5 longitudinis partem partiti, extus dense albido- vel aureo-tomentelli sed saepe basim versus subglabrescentes, intus aliquid densius tomentelli, utroque sexu laciniis angustissime lanceolatis apicem versus subulatis et acutissimis, margine integris (sed florum pistillatorum leviter incrassatis), luteis, florum staminatorum laciniarum apicibus non se aperientibus pistillatorum parum aperientibus. Antherae vulgo decem, irregulariter biverticillatae, magnae, atrobrunneae ut videtur, 0.5 mm. longae; columna suprastaminalis non gracilis, glabra, apice ipso obtusiusculo, usque ad 10 mm. (sed saepissime minus) ultra antheras producta. Disci glandulae florum staminatorum carnosulae, rotundato-triangulares, erecto-patulae, glabrae, basi connatae; florum pistillatorum membranaceae, aliquid inaequales, acuto-triangulares, usque ad 0.6 mm. longae, valde erectae, glabrae. Ovarium glabrum sed minute punctatum, globosum vel subglobosum, 2–2.2 mm. in diametro; stigmata magna, congesta, carnoso-capitata, glabra, 1 mm. in diametro. Torus floris pistillati carnosus, maxime incrassatus, quam calycis tubus multo latior,

usque ad 4.5 mm. in diametro, nigrescens. Capsula comparate parva, pyramidalis, in circuitu triangularis, apice vulgo acutissima, maturitate plusminusve 40 mm. longa sed saepe paulo longior, 30 mm. in diametro, suturis parietalibus elevatis et carpello quoque carina dorsali, longe pedunculata, laevis, atroviridis sed in suturis et carinis prominenter flava, apicem versus rufescens; paulatim dehiscens, semina simpliciter per casum non per fragorem diffusa; coccorum valvae tenues, coriaceae, post dehiscentiam valdissime contortae, in pedunculo diu persistentes, epicarpio tenuissimo, vivo perfecto levi, 0.6 mm. crasso, endocarpio 1 mm. crasso. Semina elongato-ovoidea, proclivitate longitudinaliter triangulari-ovoidea, in circuitu tetragona et valde angulosa, 20–27 mm. × 12–15 mm. × 11–13 mm. (plerumque 26 mm. × 14 mm. × 11 mm.), pallide cinereo-brunnea cum maculis irregularibus parvis spadicibus, raphide non prominenti et faciebus magnis, valde prominentibus.

COLLECTIONS EXAMINED:

BRAZIL: Estado do Amazonas, Rio Negro basin. "Insula Xiparú, São Joaquim [Nom. vulg. =] *seringa serapó.*" February 1902, *E. Ule 6023.*—Same locality and date. [Nom. vulg. =] "*barriguda.*" *E. Ule 6024* (*Hevea microphylla* var. *majoris* typus).—Same locality and date. [Nom. vulg. =] "*tambaquí seringa.*" *E. Ule 6025* (Typus).—Barcellos. 1905 (?) *A. Ducke 7027.*—Insula Xiparú, prope São Joaquim ". . . . silva profunde inundata. Arbores (3 ex.) parvae vel mediocres, trunco infra incrassato, flor pallide luteis. *Seringa barriguda* vel *seringa tambaquí.*" August 8, 1931, *A. Ducke, Herb. Jard. Bot. Rio 23750* (Topotypus).—Rio Enuixí, Lake Dondona (Municipality of São Gabriel). "Igapó. Latex white, rubbery, abundant." Tree 40 ft., [diameter] 15 inches." 1942 (?) *Ricardo de Lemos Fróes sine num.*—"Middle Rio Negro, 600 miles east [sic] of Manáos." 1942, *Ricardo de Lemos Fróes 812.*—Rio Enuixí, Lake Januari (Municipality of São Gabriel). March 22, 1942, *Ricardo de Lemos Fróes 812B.*—Rio Enuixí, Lake Dondona (Municipality of São Gabriel), May 18, 1947, *Ricardo de Lemos Fróes 22371.*—Estado do Pará, Rio Tapajóz, Belterra. "Cultivated. Original from middle Rio Negro near Barcellos." June 26, 1947, *George A. Black 47-951.*—Rio Negro, Xibarú, near São Joaquim.

"Small tree, swollen at base, but rapidly tapering upwards, slender and graceful at top. Bark smooth, red brown outside. Capsule coriaceous." October 7, 1947, *Richard Evans Schultes & João Murça Pires 8884* (Topotypus).—Same locality and date. *Schultes & Pires 8887* (Topotypus); *8888* (Topotypus).—Estado do Amazonas, Rio Negro basin, Rio Padauarí, Tapíra. November 2, 1947, *Ricardo de Lemos Fróes 22706.*—Rio Padauarí, Tipica, November 19, 1947, *Ricardo de Lemos Fróes 22888.*—Rio Negro, São Felipe (below mouth of Rio Içana). "Tree 60 feet tall, columnar, diameter 1 foot. Bark smooth but pustulate, red-brown, thin, peeling easily, hard, inside white. Bark of terminal branches red. Latex white, very watery, not coagulating, extremely sparse. Leaflets horizontal, dark green, shiny above, paler, slightly glossy beneath. Wood soft. "*Seringueira tambaquí.*" January 8, 1948, *Richard Evans Schultes & Francisco López 9591.*—Same locality and date. *Schultes & López 9593; 9607; 9608; 9609; 9610; 9612; 9612A.*—Río Curicuriarí, near mouth of river. January 22, 1948, *Schultes & López 9644.*—Río Uaupés, Taracuá, Igarapé da Chuva. "Very small tree, 20 feet tall; basally swollen, with slender, graceful whip-like trunk above swelling. Leaflets horizontal-reclinate. Latex thin, watery, white." February 3–6, 1948, *Schultes & López 9690.*—Same locality and date. *Schultes & López 9691; 9692.*—Rio Negro, Piloto (between Barcellos and São Joaquím). "Small tree. Latex yellowish, very thin. Leaflets reclinate." March 23, 1948, *Schultes & López 9735.*—Rio Negro, São Felipe (below mouth of Rio Xié). "Whip-shaped tree, 65 feet tall; basally swollen; diameter 16–17 inches, rapidly tapering to a slender trunk. Bark ½ cm. thick, hard, outside reddish brown, smooth (with lenticels), inside reddish. Latex very sparse, thin, white. Bark of terminal branchlets smooth red. Leaflets glossy, dark green above; dull, lighter green beneath, horizontal. *Seringueira tambaquí.*" April 4, 1948, *Schultes & López 9755.*—Same locality and date. *Schultes & López 9756; 9757; 9758; 9759; 9760; 9761.*—Rio Negro, Igarapé Imutá, opposite mouth of Rio Içana. Tree 60 feet tall, basally swollen, tapering upwards in whip fashion. Bark thin, smooth, hard, externally red-brown, internally tan. Latex thin, white. Leaflets horizontal-reclinate." April 4, 1948, *Schultes & López 9762.*—Same locality and date. *Schultes & López 9763; 9764.*—Rio Negro, São Felipe, downstream from Igarapé Taurí, below the town. "Slender tree 45 feet tall with slightly swollen base. Bark outside smooth, dark tan-red; inside soft, light tan. Leaflets reclinate-horizontal. Latex thin, white. Crown small." April 5, 1948, *Schultes & López 9766.*—Same locality and date. *Schultes & López 9767.*—Rio Negro between São Felipe and confluence with Rio Uaupés. "Swamp tree 45–50 feet tall, at base swollen to diameter of 12 inches but rapidly tapering upwards. Leaflets strongly reclinate.

Latex white, very sparse, watery. Bark outside smooth, light reddish tan, inside tan to whitish; ½ cm. thick, hard, brittle. Fruit ripening yellow." April 5, 1948, *Schultes & López 9773.*—Rio Negro, at mouth of Rio Içana. "Bellied tree, 14 inches in basal diameter, rapidly tapering up; 60 feet tall. Crown small. Leaflets reclinate. Fruit yellow, with three green stripes, pointed. Bark smooth, reddish tan, thin, hard. Latex very watery, white. Bark of terminal branchlets red." April 6, 1948, *Schultes & López 9780.*—Rio Içana, near mouth. "Slender tree 40 feet tall, swollen at base, in deeply flooded area. Leaflets reclinate. Latex white, thin. Crown small." April 7, 1948, *Schultes & López 9783.*—Same locality. April 11, 1948, *Schultes & López 9812.*—Rio Negro, Igarapé Carapaná (near confluence with Rio Uaupés). "Tree 60 feet tall, basally swollen, diameter 14 inches. Standing in water. Leaflets reclinate. Latex white, watery. Crown small. Bark rather scaly, outside reddish brown, inside whitish, hard, brittle, ½ cm. thick or more. Bark of branch tips red." May 3, 1948, *Schultes & López 9866.*—Rio Dimití, near mouth of the river. In deeply flooded igapó. "Tree 35 feet tall; basally greatly swollen and very abruptly tapering upwards to form a whip-shaped trunk. Crown very small. Latex white, watery, sparse. Bark thin, hard, brittle, externally tan, internally whitish. Leaflets very strongly reclinate." May 12–19, 1948, *Schultes & López 9924.*—Rio Dimití, near confluence with Rio Yauiyabú. In igapó at edge of caatinga. "Small tree 35–40 feet tall. Basally swollen, abruptly tapering upwards to a graceful, slender stem. Crown sparse. Latex thin, white. Bark externally dark tan, internally whitish. Leaflets reclinate." May 12–19, 1948, *Schultes & López 9990.*—Rio Caurés, Igarapé Mirití. June 8, 1948, *Ricardo de Lemos Fróes 23337.*—Rio Tikié, near mouth. "Small tree, 35 feet tall in standing water. Basally swollen, tapering to a graceful, slender trunk. Crown sparse. Latex white, thin. Leaflets reclinate." June 24, 1948, *Schultes & López 10167.*—Rio Padauirí, Tapéra. June 30, 1948, *Ricardo de Lemos Fróes 23299.*

Colombia: Río Guainía, near confluence with Casiquiare. "Small tree with sparse crown. Leaflets reclinate. Latex thin, white." June 1948, *Schultes & López 10035.*—Comisaría del Vaupés, Río Guainía, lower course of river, near Cerro Monachi (Cerro Heebee). "Tree 60 feet tall; basally swollen, diameter 17 inches. Leaflets reclinate. Bark rather scaly, thin, outside reddish tan, inside whitish, ½ cm. thick. Bark of terminal flushed red. Latex watery, white. *Seringa de mono.*" *Schultes & López 10041B.*

Venezuela: Territorio del Amazonas, Río Guainía, half way between Maroa and confluence with Casiquiare. "Small tree with swollen base. Height 45 feet. Leaflets reclinate. Latex white, thin. Bark dark tan. Crown very small." June 1948, *Schultes & López 10166A.*

The variability of Hevea microphylla

From an evolutionary point of view, *Hevea microphylla* is one of the most fascinating species of the genus. It is morphologically very distinct from all other species in the form and dehiscence mechanism of its fruit. As has been pointed out (Schultes loc. cit.), the capsule of *Hevea microphylla*, the valves of which never become woody but remain thin and coriaceous, opens slowly, not explosively, drops the seed directly beneath the tree, and remains attached for some time to the peduncle. Furthermore, this species is the only one in which the fruit normally ripens yellow. The epicarp, which is exceptionally thin and at first a deep, dark green, gradually lightens, becomes yellower, until the completely mature fruit is often a canary-yellow, with six green stripes along the three parietal sutures and the three dorsal keels of the carpels. The basal portion of the very ripe capsule has a definite cherry-red hue near the peduncle and this color, often spreading rather widely, approaches the sides of the capsule. One collection (*Schultes & López 9812*) had fruits which were reddening at the base, near the peduncle. It would seem that this red color is correlated with some chemical alteration which takes place the last few days before complete ripening (i.e., during the final "drying out" of the fruit structure which leads to dehiscence). I believe this because the red appears at the tip rather suddenly and spreads speedily just before dehiscence. This rapidity is more noticeable in *Hevea microphylla* than in any other species with the curious red hue. This bright red color is also particularly noticeable in the ripened capsules of *Hevea nitida;* whereas in *H. pauciflora* and *H. rigidifolia*, a very definite dull purplish-red is characteristic. In all other species of the genus, the mature capsule is normally green,

usually a dark, glossy green. The ripened capsule of *Hevea microphylla* is truly a thing of beauty.

The shape of the fruit is characteristic. It is definitely triangular in cross section and pyramidal in longitudinal section, coming to a point. Even when fully ripe, it does not swell to a rounded condition, but the dorsal surfaces of the carpel wall retain their more or less flattened shape with prominently swollen dendritic veins. It is this curious trigonous and pointed shape which, in suggesting the shape of the head of the fish called *sarapó*, is responsible for one of the common names of the plant—*seringueira sarapó* (Ducke in Bol. Técn. Inst. Agron. Norte 10 (1946) 21).

The shape and size of the seeds are unusually constant. The seed is characteristic in being more or less triangular-ovate in outline, grayish brown with large, irregular, dark chocolate-brown spots.

Nor is the fruit the only structure of *Hevea microphylla* which exhibits an outstanding peculiarity. The pistillate flowers—the largest of the genus—are provided with an extraordinarily enlarged torus which persists, even in the young fruit, as a fleshy collar.

The bark of *Hevea microphylla* is consistently thin—averaging about one-half a centimeter at about three feet from the base—and hard, often even brittle. Externally, it is usually smooth and of a tan-brown or reddish tan color; internally, there seems to be some variation, for a few of the trees examined were whitish or yellowish, others were tan, and a few were definitely reddish.

There are two remarkable and constant bark characters, however, which demand a note. One is the very thin, glossy and bright red bark of the young branches or flushes of the past year. This character has been seen elsewhere, so far as my own field experience is concerned, only in *Hevea nitida*. The other character is the ease

with which the bark will peel when small pieces are cut from the cambium. The only other species of *Hevea* which I have found to peel so easily is *H. Spruceana.*

The latex of *Hevea microphylla* is, in all of the individuals examined, extremely sparse and very watery. It is almost always white, but occasionally it will darken to an ivory color if it stands for several hours. Only one tree (*Schultes & López 9735*) with definitely yellow latex was encountered. Coagulation of the latex is always accomplished with extreme difficulty. A specimen procured by slow coagulation and drying in the air (without the use of acids) remained very sticky for a long period of time and was completely devoid of elasticity. Needless to say, *Hevea microphylla* is never tapped. It is important to note this information, since an early and widely quoted source (Corrêa, Pio M., "Flora do Brasil (1909) 115) included *Hevea microphylla* (together with *H. minor* and *H. rigidifolia*) in the enumeration of the species yielding rubber commercially. Carl D. La Rue ("The Hevea rubber tree in the Amazon Valley," U.S.D.A. Bull. 1422 (1926) 8), recognizing that *Hevea microphylla* and *H. minor* represent two distinct concepts, relegated *H. microphylla* to those "species yielding poor rubber, rarely collected."

The trunk of *Hevea microphylla* is very characteristic. The trees grow in rather dense colonies along the very margin of creeks and smaller rivers and on the rim of sand islands in the larger rivers. These areas are subject to extreme flooding. The usual height of the water during the rainy season, as indicated by waterlines on the bark, is ten to twelve feet, but I have encountered areas (near São Felipe, for example) where the tree was standing in eighteen feet (measured) of water. Inundation persists from five to six months, and even during the rather pronounced dry season, the ground rarely becomes

firm, retaining a boggy character. Probably in response to this bog or igapó habitat, *Hevea microphylla* develops a very swollen base. The basal portion of the trunk is not actually "bellied" (in spite of the use of the name *seringueira barriguda*—"bellied rubber tree"—in some localities) but is merely swollen. Above the level of the high water, the trunk abruptly tapers to a very slender and gracefully bent columnar shape (see the schematic drawing in the lower left corner of the map). The crown is unusually sparse, but the few branches are sufficiently heavy to cause a bend in the upper part of the slender trunk and, as a result, the whip-shaped habit. In this character, *Hevea microphylla* resembles certain types of the igapó-dwelling *H. Benthamiana*. Although the latter is a much stouter and more heavily-crowned tree than the former, it also has a very swollen, almost bellied, basal portion of the trunk which rapidly tapers upwards. It is almost always possible to ascend with climbing irons to the crown of *Hevea Benthamiana*, which is called *seringueira chicote* or "whip rubber tree" in some localities, but the trunk of *Hevea microphylla* is usually too slender and too flexible to support the weight of a man. Collection of the foliage and fruit was therefore made by felling the tree with an axe from the prow of a canoe during the season of deepest inundation.

In *Hevea microphylla*, we find a slight variation in the position of the leaflets and a very appreciable variation in their shape and size. Notes were taken on the many trees which were examined. The great majority have definitely reclinate leaflets, while a few have them completely horizontal to reclinate. Studies have shown that the position of the leaflets of an individual tree, once they have reached maturity, does not change with age, or with seasonal or environmental effects. At the type locality, all of the trees which I examined had very

strongly reclinate leaflets. At São Felipe, on the upper Rio Negro, where several hundred trees were seen, there would seem to be a tendency for the leaflets to be horizontal-reclinate, with some approaching a definitely horizontal disposition. Whether or not there are definite regional tendencies, it is not possible to say, but I should be inclined to doubt that large samples of populations of this tree in given localities would show any appreciable deviation from a mean in this character. In its predominantly reclinate leaflet position, which frequently deviates to horizontal or horizontal-reclinate, *Hevea microphylla* again suggests *H. Benthamiana.*

In 1910, Pax described a variety of Ule's *Hevea microphylla*—var. *major*—on the basis of variation in leaf size. In 1947, after an examination of the several Ule collections at Kew, I wrote: (Schultes, loc. cit. 4) "There are no valid reasons whatsoever for Pax's creation of *Hevea microphylla* var. *major*. Pax gives as his basis for the variety 'foliola majora, angustiora,' but *Ule 6023* and *6025* as well as *Ducke 7027* and *Ducke HJBR 23750* show all possible intergradation in the size of the leaflets, and this is known to be a character of little taxonomic value in *Hevea.*" After having seen hundreds of trees in the forests and making herbarium collections of representative individuals, I can state that *Hevea microphylla* is unusually variable in regard to the size and even the shape of the leaflets. The very great majority of the trees live up to the specific epithet, having relatively small leaflets which are elliptic or, more usually, lanceolate-elliptic, apically very long-acuminate, and measuring 7–10 cm. long and 2.5–3.5 cm. wide. Some trees (as may be seen in *Schultes & López 9691*, however, have very broadly elliptic-ovate leaflets with very short or even abruptly acuminate tips and measuring up to 9.5–12 cm. long and 4.7 cm. wide. These are extreme

variations, even for such a variable genus as *Hevea*. That Pax, who had never had an opportunity of studying this rubber tree in the field, created var. *major* should not be too strongly decried, for without a large series of specimens or some field work, such variation really would seem to be significant.

There is occasionally some variation in the texture of the leaflets. Sometimes one finds a deviation from the stiffly papyraceous texture and an approach to what we may term almost subcoriaceousness. This, I have ascertained in the field, is due neither to the age of the leaflets, nor to seasonal changes in the tree, nor to ecological factors. It might possibly be interpreted as an indication of hybridization, but after extensive association with *Hevea microphylla* in the field, I believe that, in general, there has been comparatively little hybridization of *Hevea microphylla* with other species.

Hevea microphylla customarily has subconcolorous leaves, although often they dry markedly discolorous, a phenomenon which prompted my statement, in separating the concept known as *Hevea minor* from *H. microphylla* (Schultes, loc. cit. 8) that *H. microphylla* is characterized by "folia discolora." There are, however, deviations from this subconcolorous condition. *Schultes & López 9691*, pointed out above as being atypical as to size and shape of leaflets, is also noteworthy in being rather subcoriaceous with the two surfaces, in life, differing markedly in color; the upper a dark, glossy green; the lower, a very pale, dull green. It might be argued that this tree had genic influence from *Hevea pauciflora* var. *coriacea*, but since other characters appear to be normal and the habitat was a more or less open swamp with no shade, this texture might as logically be the result of adaptation for extreme xerophytism and radiation.

In the length of the petiole, there is hardly any vari-

ation worthy of note, the very large leaves having a petiole of about the same size as the smaller, mature leaves.

Sufficient flowering material is not yet available for an appraisal of the variation in floral characters. The constancy in characters of the fruiting structures would tend to suggest little, if any, in the floral structures.

Affinities of Hevea microphylla

It would, perhaps, be premature to suggest with any definiteness the closest affinities of *Hevea microphylla.* There can be no doubt, however, but that this is the most outstandingly distinct species of the genus and is really closely allied to no other species.

In the unusually large flowers and in the apical twisting of the calyx lobes, *Hevea microphylla* somewhat resembles *H. rigidifolia.* In the lacerations of the pistillate disk, it bears some resemblance to *Hevea pauciflora* and to *H. nitida.* In the number and placement of the anthers, *Hevea microphylla* is similar to *H. brasiliensis.* The brilliant red, papery bark on the new flushes of *Hevea microphylla* finds a parallel in *H. nitida;* whereas the bark of the basal portions of the trunk, in color and in the ease with which it peels from the cambium, are suggestive of *H. Spruceana.*

In having leafy shoots or flushes which alternate with narrow rings of bud-scale scars (interflush rings), *Hevea microphylla* is grouped, in Seibert's key (Seibert, loc. cit. 291–292) with *Hevea Benthamiana* and *H. brasiliensis.* I am inclined to view this recently discovered character which Seibert has called "interflush short-shoots" as having possibly a deep significance in an evolutionary study of the group, but certainly the other characters which *Hevea microphylla* has in common with *H. Benthamiana* and *H. brasiliensis* are few and often superficial.

There is no other known species of *Hevea* which combines so many exclusive and apparently anomalous characters as *Hevea microphylla*. The unique leathery capsule and its slow and gentle dehiscence (contrasting so markedly with the woody capsule and its sudden and explosive dehiscence in all other species) has been discussed in detail by Ducke (in Arch. Inst. Biol. Veg. 2, no. 2 (1935) 235, 243) and by Schultes (loc. cit. 7). The peculiarity of this mechanism alone is enough to set *Hevea microphylla* entirely apart from all other species. The enormously swollen torus on the pistillate flower is likewise unique, for no other species of *Hevea* has an analogous structure. The green-yellow-red coloration of the capsule is unknown elsewhere in the genus. Furthermore, the shape of the seed is completely unlike that of any other species, and the curious coloration is peculiar to *Hevea microphylla*.

Huber (in Bol. Mus. Goeldi 4 (1906) 622) included *Hevea microphylla* in his series *Intermediae*, together with *H. brasiliensis* and *H. minor*, thus intimating that these three were more nearly allied to each other than to other species. Later, he suggested (in Bot. Mus. Goeldi 7 (1913) 202) that further studies might indicate the desirability of removing *Hevea microphylla* and *H. minor* from series *Intermediae* to form, with *H. rigidifolia*, a new series.

There are so many differentiating characters of the first magnitude to be found exclusively in *Hevea microphylla* that we are forced to regard the concept as standing entirely alone with no closely constituted allies in the genus. It is indeed rather puzzling. Florally, as a glance at the tabular summary of characters shows, *Hevea microphylla* has more characters in common with *H. nitida*, *H. pauciflora* and *H. rigidifolia*, which are probably the "oldest" concepts in the genus, than with any other

Summary of characters of *Hevea microphylla*

Hevea microphylla	H. Benthamiana	H. brasiliensis	H. guianensis	H. nitida	H. pauciflora	H. rigidifolia	H. Spruceana
Ecological site periodically flooded	x	x[1]					x
Tree, small to medium	x			x	x[3]	x	
Trunk basally swollen	x	x[1]					x
Trunk tapers abruptly to slender column, usually flexibly bent	x[2]						
Crown sparse				x	x[3]	x	
Bark of young flushes bright red				x			
Leafy shoots alternating with narrow rings of bud scale scars	x	x					
Leaflets usually reclinate, sometimes horizontal-reclinate	x	x		x		x	x
Pistillate flowers large				x		x	x
Pistillate flowers with swollen torus							
Pistillate disk conspicuous, lacerated				x	x	x	
Staminate flowers large						x	x
Staminate buds acute or acuminate, not truncate or obtuse	x	x				x	
Ovary glabrous or nearly so				x	x	x	
Staminate disk conspicuous	x			x	x	x	
Anthers 10, irregularly or subregularly biverticillate		x		x	x		
Valves of capsule coriaceous							
Dehiscence slow, not explosive							
Fruit ripens yellow							
Tip of fruit, when ripe, with red hue				x	x	x	
Capsule conic-pyramidal, pointed							
Seeds triangular-ovate in longitudinal section							

[1]) Some variants of *H. brasiliensis* are not basally swollen, and those growing above flood-level are rarely, if ever, swollen.

[2]) Not all variants of *H. Benthamiana* are of this structure.

[3]) Some variants of *H. pauciflora* are large trees with dense and heavy crowns.

species. I am unable, however, to see *Hevea microphylla* as one of the older concepts. On the contrary, the curious marginal distribution of *Hevea microphylla* could be interpreted to indicate that the species is a relatively new one, although what we believe to be the older concepts of *Hevea* are found abundantly represented in the same area. Ecologically, it occupies localities similar to those chosen by *Hevea Benthamiana* and *H. Spruceana*, neither of which has seemed to me to represent the most ancient species of Hevea. If it arose recently, we could wonder and well ask: "What were its prototypes?" To find an answer by studying the comparative morphology of the plant may not, at the present state of our knowledge, be an easy task, nor a productive one.

It is possible that further exploration will yield an as yet unknown species of *Hevea* which will provide some phylogenetic linkage between *Hevea microphylla* and some of the better known species. Until some such clew is available and, lacking experimental evidence of a genetic nature, the immediate affinities of *Hevea microphylla* must remain a thought-provoking mystery.

Ecological relations of Hevea microphylla

Usually one finds *Hevea microphylla* growing on the sandy rims of islands or along creeks near the main river and, therefore, subject to deep and long inundation. In both habitats, the soil is light, almost always of a sandy or lateritic nature, and highly acidic. The small bar-like islands have a low vegetation which allows the individuals of *Hevea microphylla*, small though they be, to grow in numerous, rather congested colonies and often to protrude well above the competing vegetation. Usually in the island sites, no other species of *Hevea* occupies the margin where *Hevea microphylla* is found. If the island be large enough, then *Hevea Benthamiana* can almost

always be found a small distance in from the shore. There is a band, then, where the two species are somewhat contiguous. *Hevea Spruceana* is often found along the edges and in the interior of these islands where the soil is less sandy and where a muddier condition indicates more organic residue. *H. Spruceana*, *H. microphylla* and *H. Benthamiana* are frequently seen in a contiguous distribution, but I have never found these three or *Hevea microphylla* occurring with any of the other species in a mixed stand.

This island type of habitat is found, for the most part, from the mouth of the Rio Curicuriarí downstream, probably merely because the islands above this point are smaller and almost always rock bound with little, if any, floodable area. There are, however, some small islands in the Rio Uaupés where the *seringueira tambaquí* is reported.

In the middle Rio Negro the same type of distribution found on the islands often obtains where the banks of the mainland are low and comprise flood land. At Xibarú and Piloto, for example, a visit to the banks along the river in the vicinity of the islands which are rimmed with *Hevea microphylla* showed that in certain sandy stretches along the shore itself and near the mouth of sandy creeks —wherever deep muddy silt was not abundant—this species was common. At Xibarú, I estimated a density of about four or five trees per hektar at the mouth of a creek on the right bank directly opposite the Ilha de Xibarú.

In the upper Rio Negro, we can find *Hevea microphylla* along the main bank of the river itself, and inland along low and sluggish creeks to a rather appreciable distance. The main affluents of the Rio Negro also have stands of *Hevea microphylla* at appropriate sites along their banks and near the mouth of creeks. The greatest

single concentration of this species I found at São Felipe. Immediately in back of this tiny town there are several meandering brooks which, in the rainy season, become creeks. The land about three quarters of a mile behind the town rises gently, and one finds *Hevea guianensis* var. *lutea* and *H. pauciflora*. Brooks rise on these elevations, but when they reach the low flat land lying immediately behind the town and stretching above and below along the river, they broaden and meander and, in the wet season, are lost in the general inundation which lasts from four to six months. It is in this low-lying land that one finds *Hevea microphylla*. In the vicinity of São Felipe, in the areas where it is found, it occurs to the exclusion of *Hevea Benthamiana*, and in densities which I estimated, along the creeks, at an average of about 7 to 10 per hektar. From São Felipe up to the mouth of the Rio Içana, *Hevea microphylla* is found in high concentration. *Hevea Benthamiana* grows near São Felipe, but on slightly higher banks which, unlike the meandering creek beds, protrude appreciably (up to twelve feet or more) during the dry season and become quite firm and dry. The land on which *Hevea microphylla* occurs at São Felipe, as elsewhere, is almost always boggy even though it is rather sandy. That *Hevea microphylla* sometimes occurs in estradas with *H. Benthamiana* is not ecologically significant, for an estrada is a twisting and direction-less, so to speak, path made by a tapper to reach his trees. *Hevea microphylla* is never tapped, but a tapper may pass any number of trees of this species to reach stands of *H. Benthamiana*. The estrada, in other words, may cut across the lower lying areas inhabited by *H. microphylla*.

In my field book, I wrote the following passing observations while going up the Rio Içana in April 1948: "In the Içana, *Hevea microphylla* is by far the common-

est species along the deeply flooded banks with low vegetation from the mouth up to San José. It is unusually abundant in some places. In one locality (*9783*) there were forty-two trees in one hektar! At another, farther upstream near Tapurú, twenty-six. At some points, it grows in a very slender band exactly at the water's edge; but, where the bank immediately rises to form high land, it stops and is replaced by *Hevea guianensis* var. *lutea* and *H. pauciflora*, the latter more frequently near sand than the former. At one place, *Hevea microphylla* was growing in great abundance, and twenty-five feet away from several large trees there were a number of individuals of *H. guianensis* var. *lutea*. The former were all in ripening fruit, the latter not yet in flower. There was not the slightest indication in any of these individuals that crossing had happened. *Hevea Benthamiana* has not been seen along the Içana so far, and it would not surprise me to find it absent from this river. It may be significant that the many Indians here, although producing chicle and sorva, never have produced rubber."

An incidental note entered during my work near São Felipe describes the separation of *Hevea microphylla* and *H. Benthamiana:* "Around São Felipe, '*seringueira barriguda*' or '*seringueira torada*' (*Hevea microphylla*) is extraordinarily common and abundant. The right bank of the river from well above the mouth of the Içana—as well as the lower 50 kilometers of the Içana itself—is populated with *Hevea microphylla* to the exclusion of all other species in the floodlands. On the opposite bank, this species is found in the creeks, but *Hevea guianensis* var. *lutea* controls the highest banks, whilst *H. Benthamiana* takes over the floodbanks. *Hevea microphylla* and *H. Benthamiana* are seen together below São Felipe, but only the former species occurs in the extensive 'lakes' which open out below São Felipe—and there

only on the edge of the drier land, not out in the permanent igapó vegetation (chiefly *Ambelania* sp.) of the lake itself. *Hevea microphylla* has a number of invariable companions in this region (São Felipe), and these actually serve as indicators. A *Clusia* with enormous leaves, *Leopoldinia pulchra* (the yará palm), a beautiful species of *Ouratea*, *Henriquiezia verticillata*, a medium-sized *Bombax* with a large red flower, sometimes *Mauritiella aculeata*, and, most striking of all, *Moronobea pulchra* are found occupying the same association. A species of *Manilkara*—exploited for chicle—also accompanies these plants."

Opposite Uanadona on the Rio Negro, slightly below the mouth of the Rio Dimití, the interesting Igarapé Badaití meanders into the hinterland through dense swamp and lake areas. My notes concerning this area state: "Along the banks of the Rio Negro in this region, *Hevea Benthamiana* is common. Going up the igarapé (creek), one finds several caatingas: we visited two—one caatinga-forest and one low, sandy, open caatinga. In the former, we found *Cunuria crassipes* excessively abundant—just finishing flowering and some with large, reddening fruits. . . . Continuing up the igarapé, one sees a little *Hevea Benthamiana* wherever there is *slightly* flooded ground. Farther up, *Hevea microphylla*, unfortunately now all over flowering and fruiting, begins to appear. At first it is tall—as at São Felipe—up to 55 feet in height, but with the typical sparse crown. Where inundation is still deeper—up farther in the igarapé—the tree becomes a much smaller individual, very like those at Xibarú, the type locality."

The botanically unknown Rio Dimití is unusually interesting, principally because it rises in the fascinating and mysterious mountains of the Cauaburí. Excerpts from my notes (May 14, 1948) of a rapid trip along this

river indicate the occurrence there of *Hevea microphylla:* "The lower part of the Dimití is mostly very deeply flooded igapó with the low vegetation characteristic of such areas . . . . About 20 kilometers from the mouth upstream, *Hevea microphylla* appeared. It becomes more and more abundant as we go upstream. It is a low tree of perhaps some 35 feet with at least 10 feet of this now under water in some places . . . . Further upstream, the river is reduced to a mere channel of about five feet in width winding very tortuously through deeply flooded igapó with an occasional knob of highland."

One of the most unusual habitats for *Hevea microphylla* is the low, almost treeless open "caatinga" in the lower part of the Igarapé da Chuva which empties into the Rio Uaupés at Taracuá. Here, *Hevea microphylla* occurs, standing alone with an occasional and stunted *Bombax*, *Moronobea* or *Ambelania* in an open area—a "lake" in the season of high water—covered with a very dense growth of tall grasses and sedges. The *seringueira tambaquí* in this locality is a small treelet about 20 feet tall with a crown of but two or three branches. The basal part of the trunk was characteristically swollen. There is, indeed, a striking parallel in the size and shape of the treelet and in the ecological factors between *Hevea microphylla* in this habitat and *H. pauciflora* var. *coriacea* (*H. minor*) at the mouth of the Río Guainía. I have never seen the tree (*Hevea microphylla*) as small as "ten feet," as reported by Baldwin (loc. cit.), but it becomes very small. This is due, without a doubt, to the almost permanent flooding of the locality and the resulting interference with normal growth habits.

Common names of Hevea microphylla

Hevea microphylla is most widely known as *seringueira tambaquí.* This name is used throughout its range.

In some parts of the Rio Negro, it is called *seringueira sarapó*. Both of these common names have reference to fish: the *tambaquí* is a relatively large and edible fish which often is found near the islands where, during the fruiting season, *Hevea microphylla* seeds provide a very rich and oily food as they fall into the water. The *serapó* has a pointed head and, according to Fróes, this rubber tree is called *seringueira sarapó* because of a rough resemblance of the pointed, conic capsule to the head of the fish.

In many localities of the Brazilian part of the Rio Negro, *Hevea microphylla* is called *seringueira barriguda*. This name, the same as applied to *Hevea Spruceana* in all its range, refers to the swollen basal portion of the trunk.

In several places along the Rio Negro, I have heard the natives refer to *Hevea microphylla* as *seringueira torada* or *seringueira de casca torada* [meaning "toasted"], referring to the dark tan-red color and the usual brittleness of the bark. By this term the tappers distinguish it from *Hevea Benthamiana* in their estradas, for the one is never tapped and the other is always an exploitable tree. This common name has also been reported for *Hevea Benthamiana* in the Rio Branco of Brazil.

In Colombia and Venezuela, the name *seringa de mono* ("monkey's rubber") was given to me in two different localities. It is common practice in Amazonian Colombia to denote a plant as "false" or "useless" in this way; one species of *Herrania* (a non-chocolate producing relative of *Theobroma*), for example, is called *cacaito de mono*.

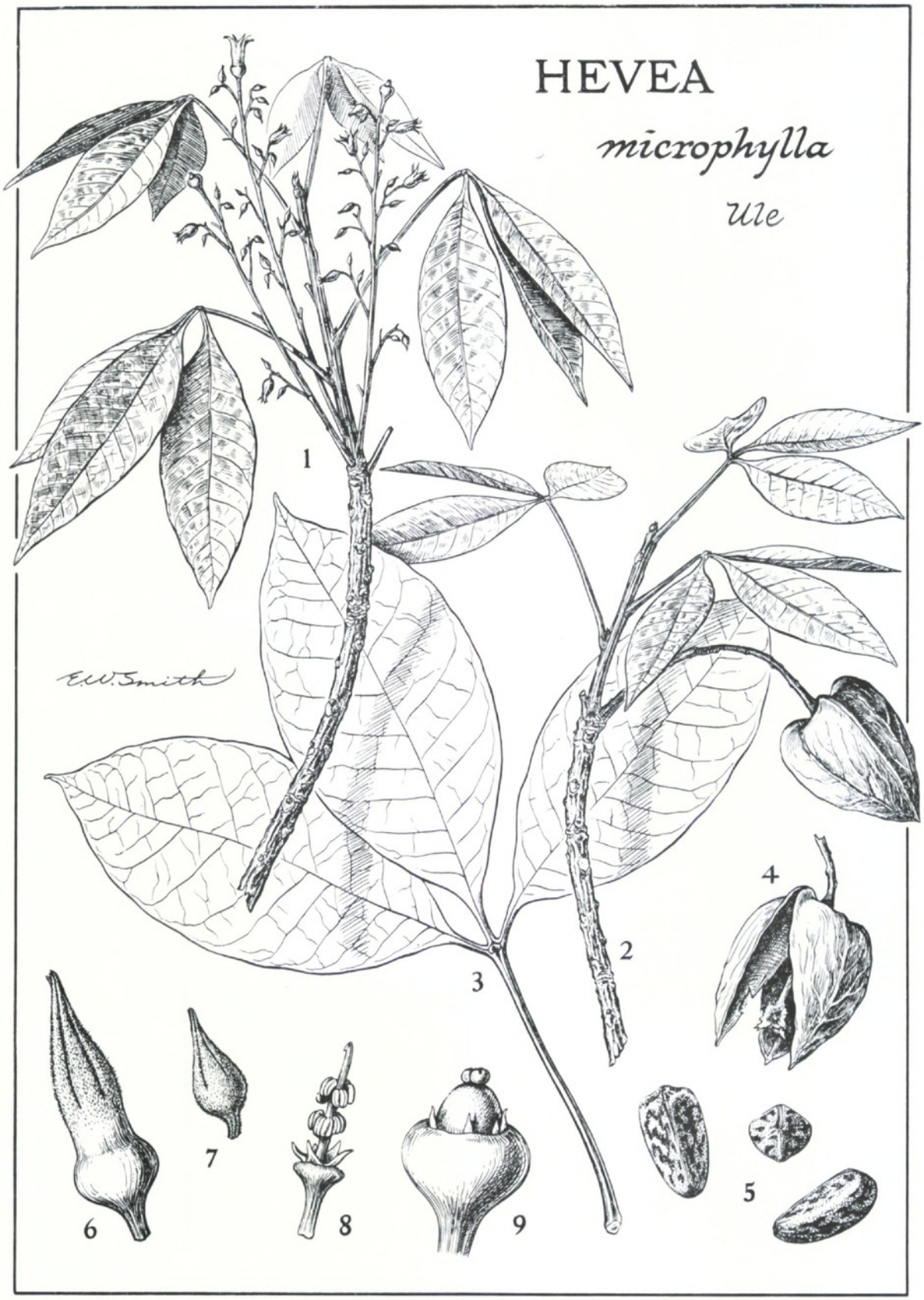
ILLUSTRATIONS

EXPLANATION OF THE ILLUSTRATION

PLATE XXXVI. HEVEA MICROPHYLLA *Ule*. 1 and 2, habit. 3, leaf showing departure from normal shape. 4, valves of capsule showing mode of dehiscence. 5, seed. 6, pistillate bud, showing terminal spiralling. 7, staminate bud. 8, staminate flower with calyx removed. 9, pistillate flower with calyx removed, showing large torus.

Drawn by ELMER W. SMITH

PLATE XXXVI



EXPLANATION OF THE ILLUSTRATION

PLATE XXXVII. Leaf variations in *Hevea microphylla* Ule.

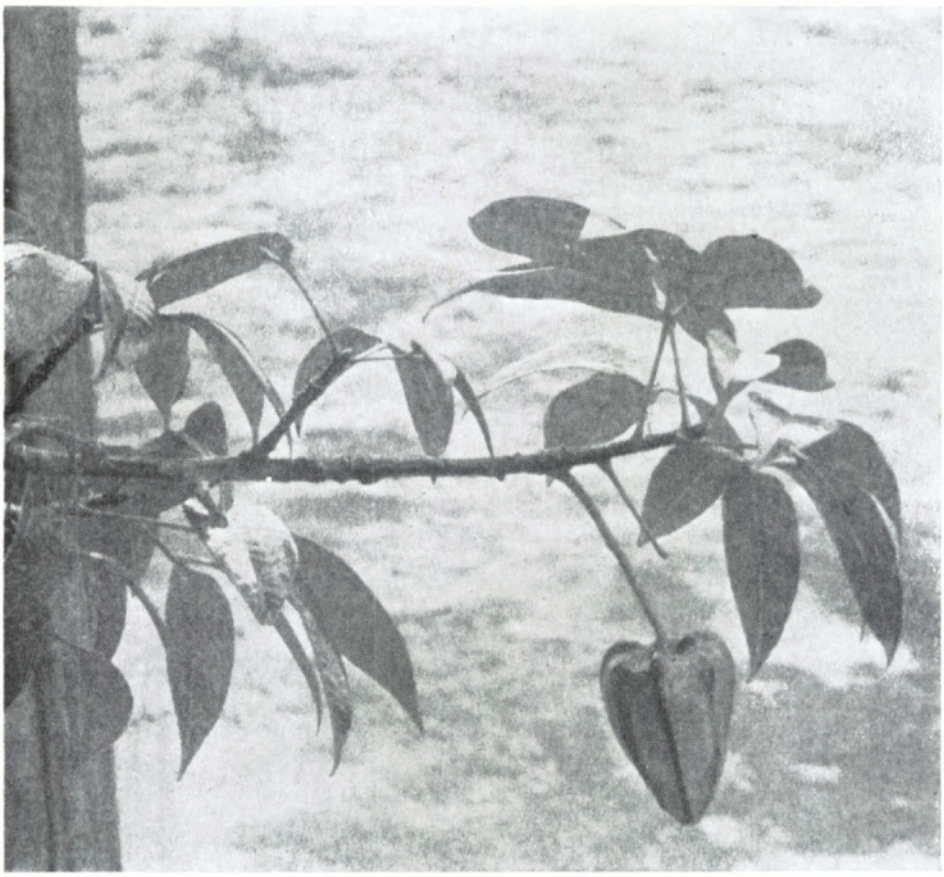
Drawn by ELMER W. SMITH

PLATE XXXVII

EXPLANATION OF THE ILLUSTRATION

PLATE XXXVIII. Leafy shoots of *Hevea microphylla*, showing ripened fruits.

Plate XXXVIII



EXPLANATION OF THE ILLUSTRATION

PLATE XXXIX. Map showing the known range of *Hevea microphylla* Ule.

Drawn by ELMER W. SMITH

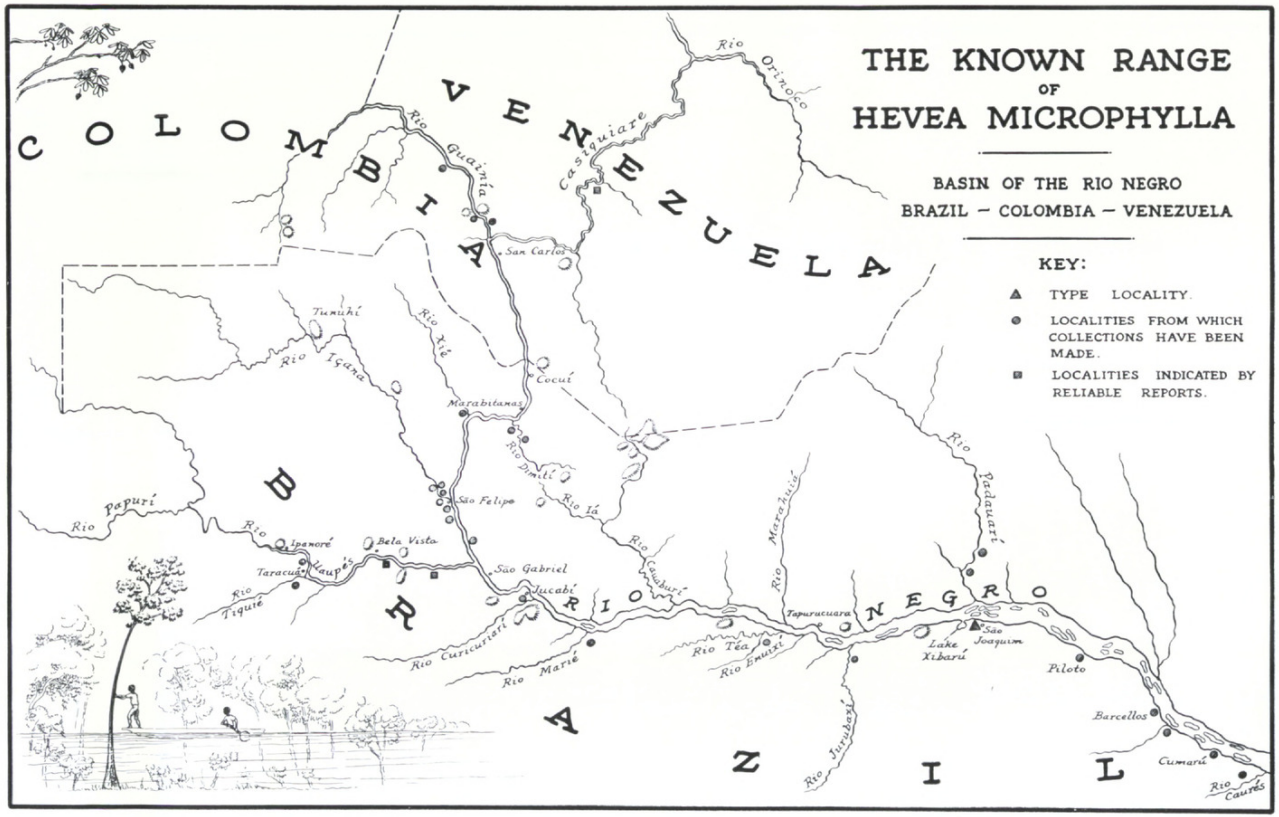

THE KNOWN RANGE
OF
HEVEA MICROPHYLLA
BASIN OF THE RIO NEGRO
BRAZIL — COLOMBIA — VENEZUELA
KEY:
TYPE LOCALITY.
LOCALITIES FROM WHICH COLLECTIONS HAVE BEEN MADE.
LOCALITIES INDICATED BY RELIABLE REPORTS.
COLOMBIA
VENEZUELA
BRAZIL
Rio Orinoco
Rio Guainía
Casiquiare
San Carlos
Tunuhí
Rio Içana
Rio Xié
Cocuí
Marabitanas
Rio Daiií
Rio Iá
São Felipe
Rio Papurí
Rio Ipanoré
Bela Vista
Taracuá
Rio Tiquié
São Gabriel
Jucabí
Rio Curicuriarí
Rio Marié
Rio Cauburí
Rio Marahuiá
Rio Padauiarí
Tapuruquara
RIO NEGRO
São Joaquim
Lake Xibarú
Rio Téa
Rio Emuiú
Rio Jurubaxi
Piloto
Barcellos
Cumarú
Rio Caurés

PLATE XXXIX

EXPLANATION OF THE ILLUSTRATION

PLATE XL. Upper figure. *Hevea microphylla*, showing the deeply floodable habitat normally inhabited by this species.

Lower figure. Trunk of *Hevea microphylla* showing the whip-shape and bellying of the basal portion.

Plate XL